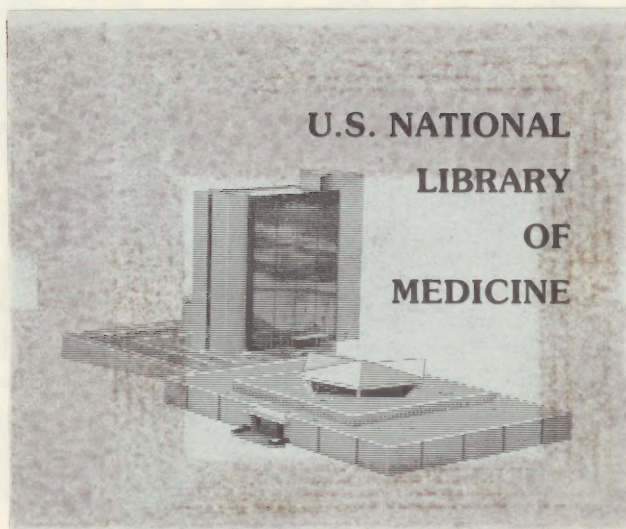


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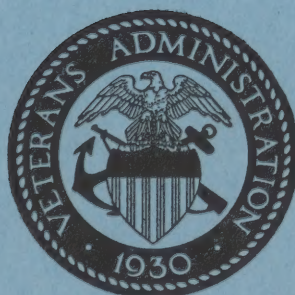
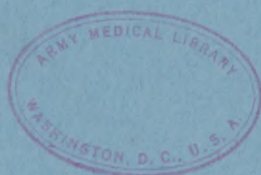
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REHABILITATION OF THE CHRONIC NEUROLOGIC PATIENT



MAY 1949

VETERANS ADMINISTRATION • WASHINGTON 25, D. C.

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U.S. Veterans administration

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Foreword

This monograph is one of the most encouraging pieces of information ever published by the Veterans Administration.

It is a principle of modern medical practice that all patients have assets as well as liabilities. But what are the assets of a chronic neurologic patient who has been hospitalized for 3, 5, 10, or even 20 years, so paralyzed that he cannot turn over in bed?

This man, obviously, has a strong will to live and enduring physical capacity to survive. Beyond this, he frequently has been looked upon as largely helpless and hopeless, a liability to himself, his family, and the hospital.

We now have, however, some methods by which this man's assets can again be mobilized, revitalized, and put into action by professionally trained persons willing to join with him in making the effort. Perhaps he can turn over in bed? Or feed himself? Or get up? Or leave the hospital? Or, yes, even go back to work.

This volume contains the technical story of how these aims can be accomplished by utilizing to the utmost our present knowledge and skills. I believe it should be on the desk of every physician.

Paul B. Magnuson

PAUL B. MAGNUSON, M. D.,
Chief Medical Director.



Preface

A large number of patients with neurologic disabilities, many of them veterans of World War I, occupy beds in Veterans Administration hospitals. A similar situation exists in many civilian hospitals throughout the country. The problem, in both its humanitarian and economic aspects, assumes an increasing importance in view of the fact that the percentage of the population 45 years of age or older rose from 17.8 percent in 1900 to 26.5 percent in 1940. This group, it is estimated, will comprise 40.3 percent of the population by 1980. The number with neurologic disabilities may be expected to rise proportionately. This means an increase both in human suffering and the costs of bedside care for these patients, unless steps can be taken to reverse the trend.

The rehabilitation of patients with neurologic disabilities would seem to be an obvious and necessary procedure. For years, rehabilitation measures have been instituted for a few chronic neurologic disabilities, such as poliomyelitis and cerebral palsy, with good results. In recent years, there has been considerable advance in the understanding and treatment of other disabling neurologic conditions.

The initiation of such measures in the general field of neurology, nevertheless, frequently meets with considerable resistance. This resistance would appear to be, in part at least, the result of a lack of

realization of how much can be accomplished even in the most severe involvements. There are other factors. The great financial savings that may be achieved has not been recognized. Then there is a lack of understanding of how retraining techniques can be applied to the neurologic patients and, of course, there is the natural resistance of individuals to any change in standard procedures and methods.

During the past few years, however, it has been possible to demonstrate the possibilities and practical gains of this approach in a program of neurologic retraining conducted at the Minneapolis, Minn., Veterans Administration Hospital. It is the purpose of this monograph to describe the essentials of the Minneapolis program.

The program has been made possible by the close cooperation and understanding given it by the entire Veterans Administration and, above all, by the enthusiasm, initiative, loyalty, and hard work of the various members of the hospital-rehabilitation team, all of whom have contributed to the development of the program and have supplied specific information for the various sections of this book.

This text, it is hoped, will serve both as a stimulus and guide in the wider application of rehabilitation techniques to the neurologic patient.

A. B. BAKER, M. D.

J. R. BROWN, M. D.

A. B. Baker, M. D., National Consultant for Rehabilitation of Chronic Neurologic Patients.

J. R. Brown, M. D., Chief, Neurology Section, Veterans Administration Hospital, Minneapolis, Minn.

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chapter I. THE PROGRAM AND ITS OBJECTIVES

1. THE PROGRAM

A. Evaluation of the Patient. A program of treatment for disabling neurologic disorders, on the basis of our present knowledge, consists of three principal parts: First, there is the evaluation of the patient, including a general medical, complete neurologic, and psychiatric examination as well as a determination of the patient's social and vocational status.

The neurologic examination includes a determination of the type of disability, particularly as to whether it is spastic, ataxic, flaccid, rigid, or combined, since each of these presents a different therapeutic problem. Such an evaluation also includes the cause, the location, and the severity of the illness and an estimation of expected progress. It is also necessary to evaluate the physical assets of the patient, both present and future, with special reference to what residual function he has or may develop. It is these residual functions

that play a great part in determining the ultimate goal of performance which the patient can be expected to attain.

Psychiatric evaluation includes an estimate of the patient's personality, his basic intelligence, and the degree of organic mental deterioration that might be present. An evaluation of the interests and potential motivating forces of the individual is of paramount importance.

The medical examination should emphasize the patient's blood pressure, cardiac reserve, urinary status, and orthopedic disabilities, since all these play an important part in the ultimate result obtained from the treatment of these patients.

The social evaluation includes the study of the patient's home situation, his attitudes towards his family, and his family's attitudes towards him. It also embraces an evaluation of the resources of the social environment.

Interrelationship of the patient and the family frequently will determine the ease with which the final result is obtained in the treatment of these patients. *Vocational evaluation* consists of study of the patient's aptitudes, abilities, and interests. The information thus gained is most helpful and often essential in the setting of a vocational and avocational goal for these patients.

B. Setting the Goal. The second phase is a setting of a treatment goal in accord with the evaluation of the patient. From this point on, all therapeutic procedures carried out are directed toward this goal. The ultimate goal selected varies greatly from one patient to another. For example, in some of the more severe hemiplegias, especially in the older age group where there is limited cardiac reserve, the maximum goal may be one of self-care activities, limited ambulation, and a hobby at home. In others, particularly in the

Fig. 1—Many patients on admission to the hospital are seriously handicapped and appear hopeless. This is the challenge to the rehabilitation program.



younger age group, a goal of greater or lesser economic independence can often be achieved. It is only in individuals who are severely deteriorated, who have a severe personality disorder, or who have a widespread and rapidly progressing neurologic disorder that some goal of treatment cannot be set.

C. Treatment Program. The methods of achieving the goals set make up the final phase of the treatment program. It is important to emphasize that success is not the result of the efforts of a single individual or single skill but requires the coordination of all therapeutic influences brought to bear upon the patient. Since this accomplishment does require the supervision and guidance of a single individual—the physician in charge of the patient—he must be acquainted with *all* aspects of the patient's condition and of the treatment program.

Keeping in mind the physical limits of the patient and the social and economic possibilities involved, one can then proceed on such a coordinated program. From a physical standpoint, this consists of physical therapy during the acute and subacute stages of the illness aimed at preventing contractures and instituting early passive and active movements. This is followed by corrective therapy which emphasizes reconditioning of the patient and re-education of the use of uninjured parts necessary for substitution problems, strengthening of all parts, education in daily self-care activities, ambulation, and adapted sports and games.

Occupational therapy should be both functional and diversional. Manual arts therapy is added later and is aimed at orienting and testing the patient in the type of job which he would be capable of handling in view of his residual disability. Adapted sports and recreation are used to provide motivation and interest, and serve, in some instances, as an easily motivated method of corrective exercise. Special speech therapy is indicated in the aphasic and dysarthric disorders.

The nursing staff must be well-informed as to the nature of the program so that they can prevent dependency on the ward and see that the patient's performance is kept abreast of his abilities to perform during the time he is not occupied with special activities. Social service therapy is instituted on the admission of the patient to the hospital and continues throughout the entire program.

It is most essential that the physician in charge regulate all of these therapeutic influences which in many of these neurologic disabilities are quite specific and important in alleviating many of the symptoms.

Because of the many therapeutic influences being brought to bear on the patients and the necessity of their supervision, it is most helpful to have some grouping of these patients. In addition to the ease of supervision, the housing of these patients in a separate unit also stimulates group spirit and aids motivation.

2. OBJECTIVES

A disabled person must be capable of accomplishing a large number of activities if he is to make a more or less independent adjustment to his environment. These activities fall into three large groups:

A. Self-Care. The disability accompanying a neurologic disorder produces greater loss of the ability to care for one's daily needs than any other comparable disease. The inability to perform these activities creates a burden to the nursing staff, lowers the patient's morale, and many times interferes with the patient's discharge plans. Inability to perform such self-care activities is most important in increasing the costs for the care of these patients. A number of principles should be followed in outlining the program for self-care activities:

- (1) The program should be initiated as soon as possible after the patient's admission to the hospital.
- (2) In the more severely involved patients, the primary aim should be to reduce the necessary nursing or attendant care.
- (3) In the less severely involved patients, the emphasis should be placed on those activities in which the patient is most deficient.
- (4) The self-care activities taught depend upon the requirements of the home or domicile to which the patient plans to return.
- (5) All personnel coming in contact with the patient should be aware of the extent of his self-care abilities and cooperate in preventing dependency.

B. Ambulation. The loss of the ability to walk is one of the most common and most distressing disabilities of neurologic disease. With most patients, there is a driving desire to walk again. This motivation facilitates the teaching of ambulation.

As in self-care, the lack of ambulation in many cases retards the discharge plans. This is particularly true since many domiciliary homes, rest homes, and soldiers' homes have standards of ambulation performance which must be met before patients are acceptable. It also plays an important part in the ability of the

patient to make an adequate home adjustment. The therapist must be well aware of the goal set for the patient and must regulate ambulation activities accordingly. It is obvious that the demands made upon an individual who intends to pursue an occupation will be vastly different from those of an individual whose ambulation will be restricted to the home.

Ambulation must be started as early as possible, both from the standpoint of maintaining a high morale and also to make a faster recovery in the ability to walk. The therapist must remember that teaching a patient to walk isn't enough. Too frequently, the practical uses of this activity are forgotten, and the patient will fall back on his wheelchair as an easier means of getting where he wants to go. He must be progressively weaned from the wheelchair by having him walk increasing distances and carefully eliminating the use of the wheelchair in going to meals, the lavatory, to daily classes, and finally for any purpose. At the same time, the elimination of the wheelchair too soon may have detrimental results. These are the general principles which must be kept in mind in the successful completion of an ambulation program:

- (1) Ambulation must be started as early as possible, both from the point of view of maintaining a high morale and also of instituting recovery of the ability to walk.
- (2) This program should be guided and limited by the patient's ability to walk and the patient's need for this function, with discharge plans for the patient always kept in mind.
- (3) The complexity of the activity and the speed at which it is performed must be progressively graduated.
- (4) It is important to transfer the teaching of the ambulation activities in the gymnasium to the patient's actual performance of them in taking care of his daily needs.
- (5) The ambulation accomplishments of the patient should be encouraged by all individuals working with the patient.

C. Social Readjustment. Any individual who has suffered a disabling neurologic disorder must make a marked personal readjustment both to his family and to his environment. Generally, the family also must make a readjustment. This is particularly true when the disability threatens the financial support and the social comforts of the family. It is important that the problem be handled in a constructive manner during the early stages of a disability. At this time, it is pos-

sible to guide the patient and his family in determining their future plans in a realistic way. If, on the other hand, this critical period is permitted to pass without attention, the family will many times work out their own plans, rejecting the patient and frequently consigning him to a position of continued dependency. Under such circumstances, it later may be difficult to persuade the family to readjust their plans to include the patient, despite his frequently very adequate physical improvement.

The rapidity and the ease with which the patient can accomplish his rehabilitation are dependent to a great extent upon proper motivation. This is obtained by various methods:

- (1) Individual interviews with the patient should be held. At the outset, such interviews are the responsibility of the doctor. He explains the nature of the illness to the patient, the general outlook and the ultimate prognosis, and the general plan of therapy. These contacts with the doctor are usually followed by further interviews with the social worker. She interprets to the patient the attitude of the family toward the illness as well as the attitude of society. It is important that everyone else who participates in the patient's program carry through a consistently encouraging theme, offering the patient a definite hope and realistic goal. If, during the course of therapy, a patient should fail to make adequate progress, then it is important for the doctor to check carefully for any emotional factors which may be retarding this patient's recovery.
- (2) The ultimate emotional adjustment of a patient and the speed of his recovery are intimately dependent upon a satisfying family relationship. Hence, it becomes important to encourage the family to participate in the treatment program from its beginning. The social worker often can play an important role as a liaison between the family and the patient in furthering treatment.
- (3) Group activities furnish one of the best methods of promoting social readjustment. The social pressures of the group provide a stimulus to the patient and prevent self-preoccupation. Exercises, handicrafts, agricultural activities, and games all lend themselves to a group setting. Friendly and controlled competition in games contributes to self-care and ambulation activities. Care must be exercised to be certain that the

patient competes with his own progress so he will not compare himself unfavorably with others.

(4) The final step in social readjustment is vocational placement. The goal to be reached will vary with the patient's age, his disability, and his employment assets. An older person with a relatively mild disability may well accept a hobby in

his own home. A younger individual with a severe disability may be able to hold a job under many circumstances. The patient must be encouraged and assisted in making plans in keeping with his total assets and liabilities.

In order to evaluate progress in the patient's adjustment and motivation, there are certain specific behavior patterns which can be used as helpful guides. These criteria, if evaluated properly, often will indicate whether the patient requires special help with his problems. A determination of the nature of the adjustment problem, however, will require individual investigation. The criteria are as follows:

- (a) *Cooperation*: How does the patient accept his treatment program?
- (b) *Initiative*: Does he attempt to carry on beyond what is actually required of him?
- (c) *Personal hygiene*: Is he interested in his personal appearance?
- (d) *Stability*: Does he show continuity in action, thinking, and planning?
- (e) *Adaptiveness*: Does he accept new situations readily?
- (f) *Consideration*: Is he thoughtful and kind with others?
- (g) *Competitiveness*: Does he enthusiastically enter into group activities?
- (h) *Determination*: How sustained are his efforts in aiding his recovery?
- (i) *Enthusiasm*: How much interest does the patient develop toward his therapy?
- (j) *Maturity*: How does he handle his emotional conflicts?

Fig. 2—The challenge met. The same patient leaves the hospital after about 3 months to return to his home and job.



chapter II. THE NEUROLOGIC EXAMINATION

In performing a neurologic examination, it is essential to check the function of individual muscles as well as to evaluate their combined action in limb motion. The muscles listed below have been selected as representative of the chief movements of the limbs. Frequently, more than one muscle will participate in the movement of a limb. For this reason, in testing for the selected muscles, one should observe and palpate the muscle tested in order to detect any substitute action of muscles in the presence of paresis of the muscle being checked. The following system is suggested for recording the *state* of the muscles:

N=Normal power.

-1=Inability to maintain position against moderate resistance.

-2=Inability to maintain position against slight resistance or gravity.

-3=Active movement with gravity eliminated.

-4=Trace of contraction.

A=Absent.

In testing for muscle function, it is most convenient to have the patient maintain a fixed position against force. The examiner is then able to test the various muscles by instituting the action of the antagonist. This obviates the necessity of giving new directions for each muscle tested and simplifies the procedure for both patient and examiner. The following fixed positions will be used routinely and will be referred to by letter:

(1) Position "A." The arm is adducted, the forearm flexed at the elbow, and the wrist across the xiphoid process.

(2) Position "B." The patient is on his back with the lower extremity flexed at 90° at the hip and knee. The examiner should support the lower limb at the ankle.

(3) Position "C." The patient lies on back with the leg and foot in normal extension.

Using the above fixed positions in testing for muscle function will be possible only if no severe paralyses are present. Should the weakness of any muscle group prevent the use of any of the above positions, then substitute positions will have to be improvised.

(1) Supraspinatus (C4-5). Initiates abduction. Holding the patient's arm at his side, have the patient attempt to abduct the limb.

(2) Deltoid (C5-6). Abduction of arm between 15° to 90°.

Have patient maintain abduction of arm at 45° against resistance.

(3) Lower Trapezius (C2-4). Elevation of arm above shoulder.

Have patient maintain elevation of arm above the shoulder against resistance.

(4) Serratus (C5-7). Fixes the medial border of the scapula. Using position "A," apply pressure in axis of humerus.

(5) Infraspinatus (C5). External rotation of the arm. Using position "A," apply downward pressure on forearm.

(6) Subscapularis and teres major (C5-8). Internal rotation of arm. Using position "A," pull the wrist away from the body.

(7) Pectoral and latissimus dorsi (C5-8). Adduction of the arm. Using position "A," abduct the arm in the midaxillary line.

(8) Brachioradialis (C5-6—radial). Flexion of elbow. Using position "A" (be sure forearm is pronated), push downward at the wrist.

(9) Biceps (C5-6—musculocutaneous). Flexion of elbow. Using position "A" but with forearm supinated, push downward at the wrist.

- (10) Triceps (C7-8—radial). Extends forearm. Using position "A," push upward at wrist.
- (11) Pronators (C6-7). Pronates forearm. Using position "A," rotate the forearm so that the upper border of the hand turns outward.
- (12) Supinators (C5-6). Supinates forearm. Using position "A," rotate the forearm so that the upper border of the hand turns inward.
- (13) Flexors of wrist (C7—median—ulnar). Using position "A," but with hand supinated, push down on the palmar surface of the hand.
- (14) Extensors of wrist (C7—radial). Using position "A," but with hand pronated, push down on the dorsal surface of the hand.
- (15) Extensors of the digits (C7—radial). Using position "A," but with hand pronated, push down on the first phalanx of each digit.
- (16) Flexors of fingers (grip) (C8-T1—median—ulnar). Using position "A," have patient squeeze your hand.
- (17) Adductor of thumb (T1—ulnar). Using position "A," with thumb adducted, pull upward on the thumb.
- (18) Opponens thumb (T1—median). Using position "A" with hand supinated, have the patient resist the separation of the tip of the little finger from the tip of the *extended* thumb.
- (19) Interossei (T1—ulnar). Extends fingers. Using position "A" but with hand supinated and fingers spread apart, attempt to approximate the fingers.
- (20) Back muscles. Using position "C," place hand beneath patient's back and have the patient arch his back.
- (21) Abdominals. Using position "C," place hand on patient's abdomen and have patient attempt to rise from a recumbent position.
- (22) Intercostals. Using position "C," observe action of intercostals on deep inspiration. Observe excursion and look for asymmetry of excursion of chest.
- (23) Diaphragm (C4). Have patient cough and note the epigastric impulse.
- (24) Iliopsoas (L2—femoral). Flexion of hip on abdomen. Using position "B," place hand above knee and push downward.
- (25) Adductors of hip (L2-3—obturator). Using position "B," place hand on the medial surface of the thigh and push outward.
- (26) Gluteus med. and min. Abduction of hip. Using position "B," place hand on outer aspect of thigh and push inward.
- (27) Quadriceps (femoral). Extension of knee. Using position "B," attempt to further flex the leg at knee.
- (28) Hamstrings (S1-2—sciatic). Flexors of the knee. Using position "B," attempt to extend the leg at the knee.
- (29) Tibialis anticus (L4—peroneal). Dorso-flexion of foot. Using position "C," place hand on the dorsal surface of the foot and push in a plantar direction.
- (30) Triceps surae (L5-S2—tibial). Plantar-flexion of foot. Using position "C," place hand on the ball of the foot and push in the direction of the patient.
- (31) Posterior tibial (L4—tibial). Inverts the foot. Using position "C," grasp the foot at the arch and rotate so that the plantar surface of the foot turns outward.
- (32) Peroneals (L5—peroneal). Everts the foot. Using position "C," grasp the foot at the arch and rotate so that the plantar surface turns inward.
- (33) Dorso-flexors of toes (S1—peroneals). Using position "C," push in a plantar direction against the dorsal surface of the toes.
- (34) Plantar-flexors of toes (S2—tibial). Using position "C," place hand on the plantar surface of the toes and push in the direction of the patient.
- (35) Gluteus maximus (S1-2). Dorsi-extension of leg at hip with patient lying on his side and with the lower limbs maintained in normal extension, place hand on back of thigh and push forward. (Fig. 2A.)

MOTOR SYSTEM: Paresis Paralysis Atrophy Hypertrophy Tonicity Limitation of movement Contractures Contractions Dysplasia Dyskenesias (chorea, athetosis, tremor, ballismus, dystonia, rigidity) Fibrillation Fasciculation Myotonus (If positive record the actual muscle or part involved)

Strength (N, 1, -2, -3, -4, A)		Other Alterations
R	L	
		1. Neck flexors
		2. Neck extensors
		3. Diaphragm (C4)
		4. Supraspinatus (C4-5)
		5. Deltoid (C5-6)
		6. Lower trapezius (C2-4)
		7. Serratus (C5-7)
		8. Infraspinatus (C5)
		9. Subscapularis + teres major (C5-8)
		10. Pectoral + latis. dorsi (C5-8)
		11. Biceps (C5-6-MC)
		12. Brachioradialis (C5-6-R)
		13. Triceps (C7-8-R)
		14. Pronator (C6-7)
		15. Supinator (C5-6)
		16. Flexion Wrist (C7)
		17. Extension Wrist (C7-R)
		18. Ext. Digits (C7-R)
		19. Grip (C8-T1-M-U)
		20. Add. thumb (U)
		21. Opponens thumb (M)
		22. Spread. fingers (T1-U)
		23. Back
		24. Intercostals
		25. Abdominals
		26. Iliopsoas (L2-F)
		27. Glut. max. (S1-2)
		28. Add. hip (L2-3-O)
		29. Abd. hip (L4)
		30. Quadriceps (L3-F)
		31. Hamstrings (S1-2-S)
		32. Tibialis ant. (L4-P)
		33. Triceps surae (L5-S2-T)
		34. Post. tibial (L4-T)
		35. Peroneal (L5-P)
		36. Dorsi flexors (S1-P)
		37. Plantar flexors (S2-T)
		38. Sphincters (S2-4)

Note: MC--musculocutaneous nerve; R--radial; U--ulnar; M--medial; F--femoral; S--sciatic; P--peroneal; T--tibial; O--obturator.

Fig. 2A—Type of form for neuromuscular examination used by Veterans Administration Hospital at Minneapolis.

chapter III. THERAPY: PHYSICAL PROCEDURES

The main details of therapy can be divided into two parts—the physical and the social procedures. In any one patient, the two categories are integrated into a single program. For the sake of simplicity and understanding, it is best to discuss them separately. The physical procedures, which will be discussed in this chapter, in general consist of exercises to retrain the patient physically. The social procedures consist of (1) the art of applying these physical procedures and (2) the methods of promoting the patient's social readjustment.

1. GENERAL PRINCIPLES

Bed rest, as is well established, causes marked changes in the body's physiology. Vascular reflexes are impaired and visceral functions are disturbed. The general musculature becomes flabby and in extreme cases will undergo disuse atrophy. Partial fixation of joints and contractures occur. Psychologically, the patient becomes dependent upon others for his simple daily needs. All of these factors have a markedly retarding effect upon the rehabilitation process. The earliest of these retrogressive changes may be noticed during the first week of an illness and are accelerated in the presence of immobility due to paralysis or pain.

To combat these retrogressive changes, the rehabilitation process is begun as soon as possible after the onset of the acute illness. The chief limiting factor is the patient's general condition. As a general rule, the physical procedures should begin within the first week or 10 days, if the patient is conscious, afebrile, and has passed the stage of serious illness.

2. BEDSIDE THERAPY

The neurologically disabled patient, as the first step toward his physical rehabilitation, is usually referred for physical therapy beginning routinely at the bedside during the subacute phase of his illness. Bed posture

is corrected and supportive measures are instituted to maintain good body alignment, to relieve tension on weakened or paralyzed muscle groups, and to prevent contractures from developing. Hot packs, or radiant heat, are used to relieve muscle spasm and pain, preparatory to exercise and re-education of weakened muscles. The Emerson hot pack and portable infrared lamp are useful sources of heat for this early bedside treatment. Massage suited to the condition being treated is used to improve circulation and to maintain the involved parts in the best possible condition for function once voluntary function has returned. (Figs. 3, 4, and 5.)

Passive motion of all involved parts must be carried out daily. It is important to carry the joint through its full range of motion. If contractures or muscle shortening has occurred, the motion should be carried to the point of pain. The shoulder, hand, hip, and knee joints are particularly important because of the rapidity with which contractures may occur and the marked effect such contractures will have on function. Weight bearing on a slightly flexed knee requires relatively great quadriceps strength. This is in marked contrast to the knee locked in full extension which can bear weight with little or no quadriceps innervation.

3. CONTINUING THERAPY

As soon as the patient's condition permits, he is brought to the physical therapy department. If not already carried out at the bedside, manual muscle tests, joint or girth measurements, and analysis of posture and locomotion are made by the physical therapist as the need is indicated. These serve as guides in determining where efforts should be directed, and as records of the patient's progress.

Mobilization of joints is continued, preceded by the physical agents used at the bedside, as described above. In addition, treatment in the reclining posi-



Fig. 3—Massage and passive motion at the bedside is a usual initial step toward rehabilitation.

tion in the Hubbard tank affords opportunity for passive and active underwater exercise, as well as full range of motion activities for all body joints. With the first sign of returning function, the patient is encouraged to assist actively in all movements. The physical therapist will initiate or complete the range of motion not within the patient's capabilities, without noticeable break in the movement. At the same time, the patient is encouraged to "think" and "feel" the movement as it is executed. With the first sign of returning function, the patient is encouraged to assist actively in all movements initiated and completed by the physical therapist. A powder-board and counter-balanced sling-suspension apparatus are used to eliminate gravitational pull in the patient's first attempt to move the part actively. (Fig. 6).

4. ACTIVE ASSISTIVE EXERCISE

Active assistive exercise is effort on part of the patient to move his limb (or part), assisted by the physical therapist. Assistive movement requires keen judgment on the therapist's part to aid only when the muscle is too weak to accomplish its movement. By alertness, the physical therapist can eliminate inertia, gravity, and friction, and thus allow a feeble and weakened muscle to carry the part through an arc of motion as completely as possible. Exercise should be carried out daily and the muscle should be worked to a point short of fatigue. This program of assistance in movement is continued until the muscle is capable of normal motion and of sufficient strength to carry the limb through a range of motion several times. The program then develops into one of active or free exercise. (Fig. 7.)



Fig. 4—Daily passive motion of involved parts through the full joint range is important in the prevention of cantractures.



Fig. 5—Body alignment and correct limb position is maintained by proper bed posture.



Fig. 6—A powder-board is useful in early attempts at active movement.



Fig. 7—Active assistive exercises may be used in movements of the trunk as well as those of the extremities.

5. ACTIVE EXERCISE

Active exercise is that type of motion given to a part of the body by the volutary contraction and relaxation of the muscles controlling the movement of the part. The patient makes the entire motion himself without assistance. This form of exercise is employed to hasten restoration of muscle function. (Fig. 8.)

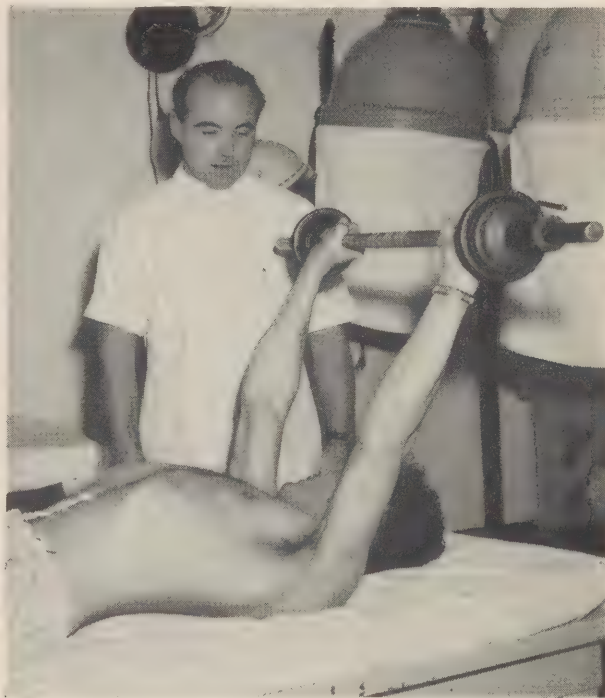


Fig. 8—Mild resistive exercises may be used to supplement active exercises.

Active exercise should be undertaken at least once daily, and the muscles should be worked to a point short of fatigue. The exact program will be determined by the nature and extent of the disability, but, whatever the condition, *the amount of effort put forth by the patient will largely determine the success of the exercises.* Consequently, attention to daily effort within the full capabilities of the patient is necessary. Because many of the patients on a neurologic service have mental impairment, the therapist must constantly be on the alert for incorrect performance of movements.

Muscle setting is one form of active exercise that can be successfully employed with neurologic patients. While hard for some patients to learn, the majority of the patients can readily be taught this exercise. It has value because it is not fatiguing, and can be practiced by the patient on the ward. Four such exercises

of extreme value to the neurologic patients are (1) quadriceps setting, (2) gluteal tightening, (3) pelvic roll, and (4) deltoid setting.

6. MUSCLE RE-EDUCATION

Muscle re-education is a basic procedure employed in the restoration of muscle function. The actual procedures used in the administration of this form of therapeutic exercise are described in most standard textbooks, and discussion here will concern itself with adaptations and limitations of standard procedures to the neurologically disabled patients. (Fig. 9.)



Fig. 9—Muscle re-education is of greatest importance in finer movements and requires the detailed attention of the therapist.

It is a principle of muscle re-education that a weakened muscle cannot contract effectively until its antagonist relaxes. It is possible to assist the muscle that is being re-educated by placing the patient in a position where gravity opposes the action of the antagonist.

A further principle of muscle re-education is that muscles may act physiologically as prime movers, as synergists, or as fixators. A muscle that has lost the ability to function as a prime mover frequently can be made to function in a secondary role. For example, if a patient is unable to voluntarily contract his lumbar erector spinae muscles, he may relearn this function

by the co-contraction that occurs during adduction and depression of the scapula while in a prone position.

Varying amounts of mental confusion gravely interfere with the normal process of muscle re-education. Patients with cerebral lesions frequently have difficulty learning, which greatly interferes with the normal process of muscle re-education. In this circumstance, use should be made of the uninvolved limb as an aid in relearning muscle function. The patient is instructed in the use of the good limb in order to guide the involved extremity through the exercises. For example, in paralysis of the forward flexors of the shoulder, good use may be made of a cane which the patient grasps with both hands and carries overhead. The principle of using a cane with the good arm guiding the poor arm also may be used for other movements.

7. RESISTIVE EXERCISES

This type of exercise is carried out by requiring the patient to perform muscular movements against increased resistance. The chief purpose of this type of exercise is the development of greater muscle power and bulk. The details of this type of exercise are standard and well-described in literature on the subject. It has two general applications in neurologic patients. First, it is used to develop uninvolved muscles in order to compensate for the disability. An example of this is the development of the arms in a paraplegic to take over the function of crutch walking. The second use is to increase the strength in weakened muscles. (Fig. 10.)



Fig. 10—Heavy resistive exercises are applied by the progressive increasing of the weight of the bell bar which is attached to the shoe.

8. PULLEY THERAPY

In pulley therapy, the intact limb moves the involved limb by means of a pulley arrangement. This type of therapy may be used for producing passive movement, for providing active assistive exercises, and in reducing contractures. In addition, it provides an opportunity for the patient to exercise himself on his own initiative. This is an important factor in transferring the exercises from the hospital to the home. Pulley exercises can be adapted to patients who are confined to bed, particularly during the acute and sub-acute phases of their illness. (Fig. 11.)



Fig. 11—Pulley therapy requires that the patient actively participate in his exercise program.

9. ATAXIA EXERCISES

Ataxia exercises are utilized in patients with ataxia of either spinal or cerebral origin. The original exercises were described by Frenkel, and adaptations of these are found in standard texts. The principle of their use is the substitution by retraining of cortical, optic, and unused spinal pathways for the damaged structures. These exercises may be used for improved coordination of the upper or lower extremities when used independently and also for improving balance and gait. In general, they begin with simple flexion and extension movements of a single joint and then progress to the more complicated movements involv-

ing the use of the entire extremity. In the arms, further progression includes such activities as picking up blocks. (Fig. 12.)



Fig. 12—The heel to knee test is one of the standard procedures in ataxia exercises of lower extremities.

Foot-placement exercises are used for improving balance and gait. These are carried out by having the patient place his feet on painted footprints on the floor. These are done at first from a standing position and later during walking. (Fig. 13.)



Fig. 13.—The ataxic patient can master the more complicated movements by foot placement exercises.

10. RECONDITIONING EXERCISES

The principle of reconditioning exercises is to aid the patient to recover the strength he has lost by inactivity. These exercises are directed primarily at general physical fitness rather than at paralyzed muscles. The reconditioning program begins with bed exercises including "quadriceps," back and abdominal exercises, and active movement of all joints. When the patient can be moved to the gymnasium, an individual program of conditioning exercises is worked out for him, including the use of mats, stall bars, chest pulleys, etc. (Fig. 14.)



Fig. 14—Supervised calisthenics to help strengthen the patient's general musculature.

11. SELF-CARE METHODS

The importance of self-care activities has been discussed in the previous chapter. It is possible to teach self-care by a combination of (1) the direct use of the patient's personal effects and facilities, (2) by the use of simulated objects, and (3) by the use of related activities in the exercise gymnasium.

The direct method is probably the best since it teaches activity in relation to application. For example, the patient is taught to shave with his own razor, to dress with his own clothes, to get into and out of his own bed, and to use regular toilet facilities. Feeding is actually taught in the dining hall. (Figs. 15 and 16.)

When it is not possible for the therapist to teach the self-care activities on the ward and in the dining hall, it is often necessary to utilize simulated objects and facilities. For example, under these conditions, the

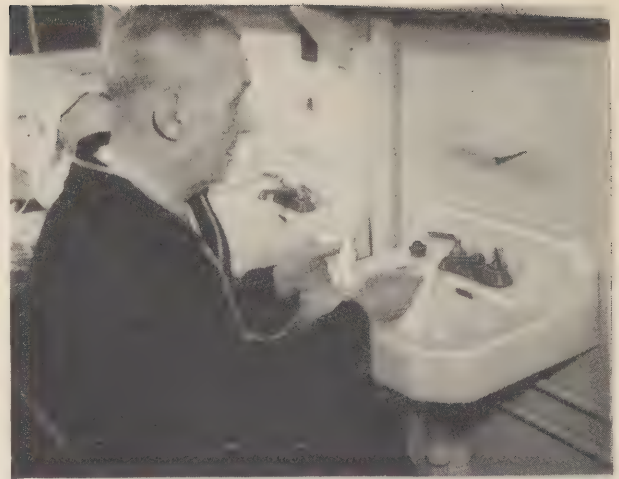


Fig. 15.—A hemiplegic patient can master self-care activities early.



Fig. 16—Feeding oneself is of utmost importance to the independence of the individual.

patient sits at a table complete with eating utensils and is taught to go through the motions of eating a meal. The disadvantage of this method is that the simulated activity often must be modified when applied to existing facilities. Often a patient may accomplish certain self-care activities by transferring skills learned in the exercise program. For example, a person who has been taught to get on and off an exercise table may be able to transfer this skill to getting on and off a bed. When this can be accomplished, it is a decided short cut both for the patient and the therapist in the accomplishment of self-care activities.

12. AMBULATION EXERCISES

Parallel bars, crutches, and canes comprise the chief equipment required in teaching ambulation. Other equipment consists of walkers, which are sometimes useful, but not essential; footprints marked on the floor which regulate the length of the step; eversion boards, which are sometimes helpful in eliminating inversion; adduction boards which permit patients with scissor gaits to walk without crossing their legs; wall parallel bars with accompanying footprints used for balancing and ataxia exercises. (Fig. 17.)



Fig. 17—The early stages of ambulation require considerable assistance from the therapist.

Ambulation starts with balancing in parallel bars and ends in unassisted walking. A patient may start at any stage and progress to any other stage depending on his physical condition at the time of referral and his ability to learn thereafter. The following are the stages in the progression to unassisted walking:

A. Parallel Bar Balancing. Before the patient can walk, he must learn to maintain his balance and shift his weight from foot to foot.

B. Parallel Bar Walking

(1) **ASSISTED.** Next, the patient is assisted with his walking in the parallel bars. He learns to maintain good posture, proper foot placement, and balance.

(2) **UNASSISTED.** He now spends a period inside the bars by himself improving his gait, decreasing his support, and gaining confidence. (Fig. 18.)



Fig. 18—When the patient can walk unassisted, greater attention is paid to the development of a proper gait.

C. Assisted Ambulation. He is now taken outside the bars and, using whatever aids necessary, he is taught the principles of crutch or cane gaits. During this period, the instructor assists the patient by actual physical support. It is impossible to set any standard progression in crutch and cane gait for the various disabilities since there is too much individual variation. Below is a brief description of the various crutch and cane gaits used by the neurologic patients:

(1) **FOUR-POINT CRUTCH OR CANE GAIT.** Left crutch, right foot, right crutch, left foot, etc.

(2) **THREE-POINT CRUTCH GAIT.** This gait is used by severely disabled hemiplegics. Right crutch, right foot, left foot, etc.

(3) **TWO-POINT CRUTCH AND CANE GAIT.** Right crutch and left foot advance simultaneously. Left crutch and right foot advance simultaneously, etc. (Figs. 19 and 20.)



Fig. 19—Two-point crutch walking is an early stage in ambulation.



Fig. 20—A combination of foot placement exercises and cane walking will serve to improve the patient's gait.

(4) **SHUFFLE TO.** Starting from a tripod position, the feet are brought forward up to the crutches. The crutches are then put forward and the procedure repeated. The feet are in contact with the floor at all times.

(5) **SWING TO.** Same as shuffle, except feet are not in contact with floor. The following chart gives the general pattern of progression followed by the majority of the different types of neurologic disabilities.

Movement	Hemiplegia	Ataxia	Paraplegia	Parkinsonism	Flaccid paralysis
"Shuffle to".....			1		
"Swing to".....			2		
"Swing thru".....			3		
4-pt. crutch.....	1 2	1	4		1
3-pt. crutch ¹	1 1				
2-pt. crutch.....	1 3	2	5		2
4-pt. cane.....	1 4	3	6	1	3
2-pt. cane.....	1 5	4	7	2	4
No aids.....	6	5	8	3	5

¹ Hemiplegic patients generally use only 1 crutch or 1 cane.

This analysis of the most commonly used walking gaits for neurologic patients does not necessarily imply that each patient in each classification follows through each of the steps designated. However, it does show the earliest stage in which each classification needs to start and the intermediate phases leading up to walking without aids.

D. Unassisted Ambulation With Instructor at Side. During this stage the instructor walks by the patient's side to give him added confidence and to improve his gait, pace, and posture. The instructor gradually increases his distance from the patient, and, at times, allows him to walk alone for short distances. Only after the instructor has observed him for a satisfactory period of time, varying with each patient, and is confident that no accident will occur, does the corrective therapist allow the patient to walk unattended. (Fig. 21.)

E. Unattended Ambulation. The emphasis during this period is on increasing the distance the patient



Fig. 21—Attended ambulation is the final stage before independent walking.

walks, speeding up his pace, improving his gait, and applying his walking ability to practical uses. He must learn to cross streets, climb curbs, ascend and descend stairs, streetcar and bus steps, walk to his meals and the lavatory, and get along without his wheelchair. (Fig. 22.)



Fig. 22—Practice in stair climbing unattended is essential before ambulation is complete.

13. REHABILITATION GYMNASIUM

Good results in neurologic rehabilitation are not dependent upon expensive equipment. In a corrective gymnasium, the ambulation section should be about 50 feet long and the exercise section about 30 feet. Parallel bars can be placed on one side wall. Next to these parallel bars, a simulated street can be erected consisting of two curbs, 8 inches in height, and a stop-and-go light. One should also have two stairways with railings available, one having a 7-inch and the other a 15-inch step leading to a 3-foot platform. This latter step is used primarily to teach the patient to enter buses and streetcars. The exercise area should cover about 30 feet in length and about 10 to 15 feet in width. This area should contain exercise tables and exercise chairs as well as bar bells, weight shoes, and different-sized weight bars ranging from $1\frac{1}{4}$ to $12\frac{1}{2}$ pounds. This area should also contain various types of corrective apparatus such as shoulder wheels, wrist circumductors, supinator pronator machines, overhead pulleys, etc. Also, in this area, are placed the mats, medicine balls, dumbbells, etc., for general body conditioning. Full-length mirrors should be used to help the patient observe and maintain correct gait. It is important that the equipment used should be simply constructed and readily adaptable for use in the home so that the program started in the hospital in many cases can be continued after the patient is discharged. From a practical point of view, the re-



Fig. 23—Proper organization of a rehabilitation gymnasium enables the therapist to supervise the corrective therapy of large groups of patients.

habilitation gymnasium should be located near the hospital wards. This enables the corrective program to be applied directly to the patient's daily activities. (Fig. 23.)

14. SELF-CARE AND AMBULATION CHART

The primary puropose of this chart (fig. 25) is to provide a comparative means of evaluation of the patient's self-care and ambulation activities. It can also be used as a check-list for activities to be practiced, as a means of charting progress and as a determining factor in the patient's disposition.

This chart was designed to include as many important activities as possible and at the same time to provide a concise and workable form. A certain number of these might require some amplification. For example in the self-care chart, item 1, which indicates the patient's ability to change his position in bed, also requires that he be able to turn completely and return to the same position; item 19, which refers to the patient's ability to go to the toilet unassisted, also requires that the patient be able to readjust his clothing in doing so; item 20, includes opening and closing the car door, as well as getting in and out of the door; finally, item 24, which refers to the patient's ability to take a bath without assistance, also gives equal importance to the patient's ability to take a shower.

In the ambulation chart, item 5 gives the patient credit only if he can walk 50 feet unassisted in parallel bars; in items 9 and 13, the walking on crutches and canes similarly requires the ability to travel at least 50 feet; and finally, under item 19, the patient is given credit for discarding his wheelchair only when he no longer uses it for any reason.

Generally, as soon as the patient is referred to corrective therapy, his self-care and ambulation efficiency is checked and recorded. All activities learned thereafter are recorded by date. Periodically during the program, the patient's total self-care and ambulation scores are checked and compared with his previous ratings. In using these charts, it has been found that patients whose combined self-care and ambulation scores are less than 25 percent present a nursing problem and require considerable attendant help. Those who score in the 50-percent range are reduced nursing problems but still present a formidable problem in the home. A patient who scores in the 75-percent range requires at most a small amount of help, is a good candidate to return home, and in many cases is capable

of selected work. The patient who scores near 100 percent on self-care and ambulation is quite independent and, in many instances, is employable. Again it is repeated that a perfect score in ambulation and self-care does not represent the 100 percent of a normal individual, but rather that the patient would be capable of meeting the essential physical requirements of daily living. At the same time, he would certainly be able to make a most satisfactory physical adjustment to his own home.

In order to be certain that the nursing and attendant staff keeps informed as to the progress of the patient, a self-care bed tag has been designed. This bed tag lists eight of the more significant self-care activities. The nursing and attendant personnel consult the tag to determine how much help the patient actually needs. An example of this tag is illustrated in figure 24.

CORRECTIVE THERAPY
BED TAG

Name

In and out of bed alone.	
Use toilet alone.	
Feed self.	
Walk to meals.	
Wheel to meals alone.	
Wash self - brush teeth.	
Discard wheel chair.	
Clothe self.	

SPECIAL CONSIDERATIONS:

Fig. 24—Self-care bed tag.

SCORE FOUR POINTS FOR EACH ACTIVITY

SELF CARE

AMBULATION

1. Change position in bed.		1. Arise & stand w/aid in par. bars	
2. Feed self		2. Arise & stand w/o aid in par. bars	
3. Wash hands and face		3. Shift weight from foot to foot in parallel bars	
4. Brush teeth and comb hair		4. Walk in par. bars with assistance	
5. Write name and address		5. Walk in par. bars w/o assistance	
6. Use telephone		6. Walk with assistance of Instr.	
7. Sit up for six hours		7. Walk w/o assistance, Instr. by side	
8. Get from lying to sitting pos'n.		8. Arise to stand from w/chair w/o aid	
9. From sit on bed to stand		9. Walk alone using crutch	
10. Tie pajama bottoms		10. Climb stairs with railing	
11. Put on & take off shoes		11. Climb stairs w/rail backwards	
12. From bed to w/chair to bed		12. Walk sideways & backwards	
13. Sit and arise from armless chair		13. Walk alone using cane	
14. Put on & take off pajama bottom		14. Walk on ground & carpeting (rugs)	
15. Put on & take off pajama tops		15. Open and close door from stand	
16. In and out of chair at table		16. Climb bus steps	
17. Shave self		17. Climb curb	
18. Pick object off floor		18. Climb steps w/o hand rail	
19. Use toilet w/o assistance		19. Discard wheel chair	
20. In and out of car		20. 1 point for following distances:	
21. Tie shoes		21. 25 50 75 100 150 200	
22. Put on and take off braces		22. 300 400 500 600 700 800	
23. Clothe self completely		23. 1 point for following times--48 ft.	
24. Take bath w/o assistance		24. 85 80 75 70 65 60	
25. Get from floor to stand		25. 50 45 40 35 30 25	
Date			
Self Care			
Ambulation			
Date			
Time			

Fig. 25—Self-care and ambulation chart of requirements for daily living.

15. OCCUPATIONAL THERAPY EQUIPMENT

Occupational therapy plays a part in both the physical and social rehabilitation of the neurologic patient. The social aspects of occupational therapy will be discussed in the subsequent chapter. From the physical point of view, this type of therapy can be a means of increasing muscle strength, joint motion, and coordination of movement. In all cases, the therapist correlates her program with those of other services.

When increased muscle strength is indicated by the prescribing physician, a course of exercise is planned, progressing from active-assistive to graded-resistive activities. Wherever a normal extremity can be used to aid the affected limb, equipment is adapted to make such exercise possible. Suspension slings are used to eliminate gravity for upper extremities, and many hand tools are constructed for two-hand use. It has been found that the most adaptable medium for the neurologic patients is weaving in all of its various

forms. The operation of the loom can be adjusted to require the patient to exercise any desired muscle group. The exercise can also be graded by the weight of hand tools or by the resistance of the hand levers on such equipment as a printing press, jigsaw, or sewing machine.

In a similar manner, graded force is applied for stretching contractures and increasing joint motion. In patients with impaired coordinations or dexterity, activities are graded from gross to fine movements or from simple to complex muscle action. Weaving, gardening, beadwork, jigsaw puzzles, various board games, and printing are excellent activities to promote increased coordination.

Throughout the course of treatment, the therapy is constantly guided by the suggestions of the physician in charge of the patient's condition, and necessary changes are made when indicated in order to further total rehabilitation.

chapter IV. THERAPY: SOCIAL PROCEDURES

1. THE ROLE OF THE PHYSICIAN

The program of neurologic rehabilitation is carried out under direct supervision of the neurologist who assumes the over-all care of the patient from the time of admission. He directs the evaluation of the patient and the speed at which therapeutic procedures are instituted, working in close cooperation and consultation with the physiatrist and all members of the rehabilitation team.

Detailed history and examination of the patient are carried out on admission. (Fig. 26.) Complicating illnesses, such as hypertension, gastrointestinal disease, urinary tract difficulties, cardiac complaints, and orthopedic disabilities are carefully investigated by appropriate tests and consultations. The physician must be schooled to carry out his own psychiatric evaluation, calling for more experienced help when needed. This psychiatric evaluation is of the utmost value and cannot be overemphasized.

The neurological examination and diagnosis includes detailed studies to determine the location, nature, and extent of the lesion. Corrective medical or surgical procedures may be instituted. These may, for example, include measures to control pain, reduce spasticity, or decrease rigidity.

It is essential to evaluate the patient with the attitude of searching for what *functions are remaining* rather than what have been destroyed. These assets are the building stones of rehabilitation. Many patients considered hopeless when viewed from the standpoint of disability are found to have resources for rehabilitation when approached from the point of view of assets rather than liabilities.

After the evaluation of the patient, a tentative goal and procedure is often set after consulting with the various other members of the rehabilitation team. It is the physician's responsibility to keep track of the

patient's progress. If it is slow, the physician must avoid permitting himself to become discouraged, but rather investigate its cause. It is easy to reject the patient who fails to make progress but is far more gratifying to motivate him to improved function.

An outstanding problem is that of *emotional readjustment* of the patient. In disabilities of short duration, the outstanding feature is that of a depressive reaction to the illness. This can be combated by early planning and working toward the goal. It is important that all personnel in contact with the patient be aware of this reaction and guard against it. The patient is generally given support early, and later is encouraged to take over more and more activities.

Among many patients, there is emotional lability due to the organic damage early in the disease. Patience and a calm attitude will encourage the patient to gain more control. A similar attitude is advisable when aphasia complicates the picture.



Fig. 26—A detailed knowledge of the nature of the physical illness and any complicating diseases is required before rehabilitation can be started. An examination of the eyes is part of this examination.

When the disability has been present 6 months or more, the problem of emotional readjustment is more difficult. Many of such patients develop a marked dependency reaction. An occasional patient will show considerable stubbornness and some hostility. It has been possible in our experience to convert these feelings into strong, stubborn motivations to walk again. A fair percentage of patients make their readjustment with a minimum of guidance.

Drug therapy may be described briefly here, but it is important to note that sedative drugs are usually unnecessary in patients on the rehabilitation program. Anticonvulsants are required in some patients. Specific and supportive drugs are used as indicated in individual cases for treatment of pernicious anemia, diabetes, cardiac decompensation, lues, urinary infections, etc. For care of the urinary bladder, decubitus ulcers, skin grafting, and similar problems, one must refer to the literature on these subjects.

There are certain special medications which have received considerable attention within recent years, particularly in the rehabilitation of neurologic disorders. The use of most of these drugs in nontoxic doses has been based on the theory that they will effectively reduce muscle tone in the presence of spasm or spasticity. Controlled experiments, however, still leave considerable doubts as to whether any of these drugs have any such specific action in the dosage as recommended. Further experimentation would be required to either confirm or deny their effectiveness before specific credit can be given these drugs for the results obtained. The use of such drugs, however, sometimes seems to be of definite psychotherapeutic value and tends to make the patient more willing to accept the physical modalities.

Tubo-curare in oil has been used subcutaneously in an attempt to secure prolonged effectiveness in the reduction of muscle shortening and spasticity. This drug in too great a dosage may produce respiratory difficulties and hence, if used, must be administered carefully. For details of its use, one should refer to the specific literature on the subject.

Myanesin is a newer drug. Its action is somewhat similar to that of tubo-curare. It may be taken by mouth and may exert toxic action, particularly upon the kidneys.

Prostigmine is taken by mouth and has been popularized within recent years for the treatment of muscle spasticity and shortening. Most investigators agree, at the present time, that if adequate patient

controls are used this drug has little or no value in such cases.

Dihydro-beta-erythroidine is an oral product with a curare-like effect. It seems to have some beneficial effect in the rigidity of parkinsonism but has little usefulness in the treatment of muscle spasticity. Objective experiments on this drug are not yet available.

2. THE ROLE OF THE NURSE

Care of physical being. When the patient begins his rehabilitation he has already passed the acute stage of his illness and, being handicapped, is generally faced with a formidable problem of readjustment. This readjustment, both physical and emotional, can be greatly eased by a nurse who participates actively and intelligently as part of the treatment team. There are a number of specific contributions which the nurse can make. First and foremost, she must direct her attention toward the physical welfare of the patient, such as the care of the skin, the care of the bowel and bladder, prevention of deformities, nutritional needs, and sleep requirements. (Fig. 27.) In confused or aphasic patients, it may be necessary for the nurse to be particularly attentive to these needs since the patients themselves will have difficulty in cooperating.

Care of emotional readjustment. The emotional readjustment of the patient to his disability can be greatly facilitated by an understanding nurse. It is most important for her to understand the patient's likes and dislikes. This can be obtained by an early interview with the relatives, who can provide a great deal of information concerning the patient's habits before his illness, such as his food preferences, smoking habits,



Fig. 27—A daily bed bath is very important not only for the morale of the patient but for the protection of the skin against break-down.

his toilet habits, amount of ventilation during sleep, etc. A little attention to these preferences can go a long way in obtaining better cooperation of the patient with the program and with the staff. As the patient improves, he should be encouraged by the nurse to enter into group and recreational activities.

Coordination with other parts of the program. In the rehabilitation program, principles of self-care and ambulation activities are taught during specific periods; but the nurse on the ward must encourage and supervise their constant application to the practical needs of the patient. For example, as soon as the patient is able to turn from side to side, it is the nurse's responsibility to see that he does so at regular intervals; if the patient is able to walk on crutches, the nurse does not permit him to resort to his wheelchair. The self-care bed tag, in this respect, proves a valuable adjunct, indicating to the nurse what activities the patient is able to perform. In certain instances, the nurse can aid greatly in teaching the patient certain self-care activities. Probably the most common of these are feeding and toilet activities. The nurse's activities in these respects naturally should depend upon the patient's disability.

3. THE ROLE OF THE SOCIAL WORKER

The role of the social worker is to assist the doctor in the emotional, social, and economic readjustment of the patient and the family. The evaluation of the patient's social setting, which includes his family situation, his past work record, and his economic status, becomes one of her first responsibilities in rehabilitation. This information is most essential in determining the goal and in developing the treatment program. (Fig. 28.)

By continuing contact with the patient throughout the course of treatment, the social worker assists in interpreting the treatment program and goals and in laying the groundwork for a healthy philosophy of readjustment and a willingness to accept a state of independent although modified usefulness. The social worker often can help provide a patient with a favorable mental attitude and a sustaining incentive and can keep the doctor informed of the patient's emotional status.

As the patient's adjustment progresses, the social worker plays a very important role in helping guide and orient the family in their participation in the patient's problems and recovery. An understanding family can be most helpful to the patient and the



Fig. 28—Cooperation with the family obtained by an early interview with the social worker goes far in encouraging the patient in his participation in the program.

physician. Lack of cooperation on the part of the family often is a result of lack of understanding of their role rather than their unwillingness to help.

Finally, as progress is made both physically and emotionally toward recovery, the social worker plays an essential role in arranging for proper occupational situations outside the hospital or within the home. Such occupational situations must fit the patient's limitations. These final plans are of utmost importance because they often enable the patient, in spite of certain physical limitations, to assume a position of at least partial economic independence. Many of the necessary skills can be developed in the hospital or the home, but it is a great step to transfer from the protected environment of a hospital to the harsh competitive atmosphere of society. The social worker again can play an important role in helping the patient bridge this gap and make the adequate outside adjustment which ultimately leads to a complete recovery.

In order to advise the patient and the family adequately and to help both plan correctly, the social worker must have a complete understanding of the nature of the patient's illness, the limitations of recovery, and the ultimate physical and economic adjustment that will be possible. Such guidance can only come from the doctors and others in the rehabilitation team who are aiding toward the patient's physical recovery.

The social worker, in carrying out her function, must develop and utilize various community resources which are available both within and outside the Veterans

Administration. It is of importance to be acquainted with the following resources and to use them to their utmost:

OFFICIAL VA SERVICES

1. Special services.
2. The voluntary services advisory committee (includes all veterans organizations).
3. Regional office social service.
4. Outpatient clinics.
5. Clothing committee.
6. Medical rehabilitation board.
7. Veterans Administration domiciliary homes.
8. Contact representative.
9. Chaplains.
10. Chief attorney, regional office.

COMMUNITY RESOURCES

1. The American Red Cross (field director, home service department, gray ladies, motor corps).
2. Department of veterans' affairs (State).
3. The public welfare agencies.
4. Community Chest agencies.
5. United States Employment Office.
6. State rehabilitation program.
7. County service officers.
8. Special housing listings (houses within the hospital vicinity which rent rooms at a nominal fee to patients' families who come from out of town).
9. Central index (social service exchange).
10. Clergymen.
11. Private convalescent homes.
12. Soldiers' homes.
13. Public Health nursing services.

4. THE ROLE OF THE PHYSICAL THERAPIST

The physical therapist makes an early contact with the neurologic patient and therefore shares in the responsibility for a favorable beginning in the process of rehabilitation. Much depends upon this initial approach. The physical therapist, therefore, may go a long way toward allaying apprehension, quieting resentments, and creating a desire to join wholeheartedly in the therapy.

Ideally, the rehabilitation process begins at the bedside, where the therapist instructs the patient as to the purpose of the various procedures as they are introduced. The patient is instructed in proper bed posture and proper exercises necessary to avoid the de-

teriorating effects of inactivity. Close affiliation of the therapist with the nursing staff contributes materially to the effectiveness of supportive measures and the regular performance of simple movements which the therapist has taught the patient. Any gains made by the patient which can be carried over into his daily activities are made known to those in charge of his program so that they may be incorporated in the routine activities of the patient.

The physical therapist periodically makes and records an evaluation of the patient's muscular weakness, body mechanics, etc. (Fig. 29.)



Fig. 29—Detailed and repeated muscle examinations are carried out by the physical therapist.

By calling attention to each gain, however slight, the therapist can contribute to the morale of the patient. The physical therapists, because of their early and frequent contact with the patient, are in a favorable position to detect physical defects and emotional problems that might arise early in the treatment process. Evidence of skin lesions, threatening decubiti, or early contractures can be immediately called to the attention of the doctor and thus eradicated. Family and personal problems that are troubling the patient and perhaps slowing recovery often are discussed with the therapist during treatment. An alert and understanding therapist can many times help the patient with the simpler difficulties and can inform the physician concerning some of the more complicated problems.

5. THE ROLE OF THE CORRECTIVE THERAPIST

The corrective therapist plays a dominant role from the time the patient is able to leave his bed until the patient leaves the hospital. The early activities consist of individual instruction of the patient. As soon as possible, this individual therapy is replaced by group activities in which the patient assumes more and more responsibility for his own rehabilitation.

Individual instruction.—Individual instruction of the patient is primarily a means of physical rehabilitation; it serves, however, as a social procedure because it enables the corrective therapist to develop rapport with the patient and prepares the patient for group activities. The corrective therapist works *with* rather than *on* the patient and has a role somewhat similar to a coach.

Group exercise therapy.—One of corrective therapy's greatest contributions to the physical, mental, social, and economic rehabilitation of neurologic patients occurs through its group activities. They are the most effective means of providing motivation, creating high morale, and encouraging voluntary participation. In the exercise room the patient has the opportunity of observing and working with men of like disabilities in all stages of recovery. He is encouraged to compete with and to try to excel other patients in the various activities which they do together. Records are kept on charts, which are conspicuously displayed, so that he might see at a glance how he compares with others as well as with his own record. Activities which readily motivate him through controlled competition are speed in walking, distance in walking, upper and lower extremity weight lifting, and increases in range of motion. (Fig. 30.)

Group recreational therapy.—The recreational period is a means of continuing socialization of the patient at times other than those spent in doing definite prescribed exercises. Patients who are often lukewarm in regard to exercise become enthusiastic in competing with others during the game period. This enthusiasm is often then carried over to the exercise period. In addition to its socializing value, the recreational period can be utilized for retraining the left hand in right hemiplegics, for developing dexterity by throwing darts and balls, and increasing the patient's tolerance for exercise.

The exercise room, when not occupied, can be used for recreational therapy. During these periods, patients should be grouped according to their disabilities



Fig. 30—In teaching activities such as ambulation, it is possible for the patients to work in small groups.

and proficiency in games. Great care should be taken to eliminate the domination of a group by any one individual. As soon as a player shows a tendency in this direction, he should be moved to a higher group. In this manner, all patients have the opportunity of gaining the satisfaction of winning. At the conclusion of the recreational period it is helpful to serve light refreshments which furthers the spirit of camaraderie. There are a number of simple games which are adaptable for even severely disabled patients which are listed on the next page.

1. Darts and dart boards.
2. Various-sized balls and various-sized pails or boxes into which the ball is cast.
3. Quoits.
4. Putter golf.
5. Rubber rings and pegs.
6. Shuffleboard.
7. Wheelchair basketball.

Volunteer workers.—Volunteer workers may play an important role in the social readjustment of disabled patients by assisting with the activities which do not require supervision by a corrective therapist. Before taking an active part in the program, the volunteers should be thoroughly indoctrinated and briefed in the activities in which they are expected to participate. Patients frequently develop attachments to certain volunteers which acts as an added stimulus for their participation in the program.



Fig. 31—Sports adapted to the patient's ability furnish motivation and group spirit as well as exercise. This can be supervised by volunteers.

6. THE ROLE OF THE OCCUPATIONAL THERAPIST

The occupational therapist plays an even more important role in the social than the physical adjustment of the patient by encouraging group activities, by prevocational exploring, and by developing avocations. Although all of the treatment in occupational therapy is on an individual prescription basis, the activities which bring patients together in the clinic are a definite aid to socialization. The clinic resembles a normal working situation in many respects, and the friendly competition which arises in comparing projects is encouraged. The patients often help each other with craft techniques and contribute to the department by constructing tool cabinets, flower boxes, shuttle racks, etc. Good work habits are encouraged at every opportunity.

A common problem is the concern of the men about their finances and their means of earning an income. By the use of certain activities, specific diagnostic data for personality evaluation may be provided and vocational (work) interests determined, indicating what the patient may be trained to do to develop his prevocational or avocational abilities. Information on the patient in the form of progress notes for his medical record may be used by manual arts therapy and vocational advisement. Some of the activities which may lend themselves in prevocational exploration are woodworking, gardening, sign painting, model construction, leatherwork, weaving, and jewelry. (Fig. 32.)

For older patients, whose posthospital goal is self-care and limited ambulation, it has been found helpful to provide an avocational interest. This may develop into a remunerative hobby, or it may be a means of maintaining morale by constructive use of time.

Previous to their discharge, these patients are encouraged to make the simpler equipment while volunteer organizations are encouraged to donate the more complicated occupational tools for use at home.

7. THE USE OF MANUAL ARTS THERAPY

This activity is generally more applicable to the younger patient for whom an employment goal has been set. By simulating the demands of various types of work in industry or trade, objective data is made available to medical staffs so they may advise whether or not posthospital vocational goals are com-



Fig. 32—Plastic projects serve as an excellent form of occupational therapy for parkinsonism.

mensurate with disabilities. It is particularly well adapted to patients with flaccid paralysis, paraplegia, hemiplegia, and similar illnesses resulting in residual disabilities that may affect a person's capacity for work. (Fig. 33.)



Fig. 33—Manual arts is of special interest to the younger men where they can do prevocational exploring. It is adaptable to group activities.

8. THE USE OF VOCATIONAL COUNSELING

The main function of vocational counseling is to advise the disabled individual as to the best means for him to earn a living. Since most people earn their livelihood by the use of their hands or their voice—functions which are often severely involved in neurologic disabilities—counseling this group of patients presents certain special problems. Here are some of the more important of these problems:

Manual dexterity.—With the exception of the paraplegics, this is one of the most constantly and severely involved functions. It is possible to evaluate the patient's dexterity as compared to the general population by means of the Minnesota rate-of-manipulation test, the Purdue peg-board test, or similar tests.

Speech involvement.—Speech involvement, although important, plays a less prominent part in the patient's disability if there is reasonable manual dexterity. The procedures of handling the speech difficulty will be discussed in a future paragraph.

Convulsions.—Symptomatic convulsions, if evaluated and treated properly, generally can be fairly well controlled in most patients. Even the best of control, however, leaves the possibility of occasional seizures and hence creates certain vocational problems. It is important to see that the patient does not plan for an occupation that will be dangerous to himself or others, such as driving a vehicle, working at high

altitude, or using power machinery. Because of certain social prejudices and compensation restrictions, certain vocations are not open at present to patients with convulsions and must be taken into consideration in the vocational guidance of these individuals. (Fig. 34.)



Fig. 34—Detailed testing of the patient's abilities is one of the functions of vocational counseling.

Nature and course of the illness.—In involvements of the nervous system, there is a considerable variability as to the degree and course of the illness. These factors require careful consideration in every case for adequate counseling. Although the approach in an arrested disease will be different from that in a progressive disease, one can, even in the latter, continue to make limited vocational plans. Even in patients with organic brain deterioration, a vocational adjustment at a lower level may be possible. Within the limits imposed by the factors described above, vocational counseling consists of four steps:

- (1) Evaluation of the patient by means of individual interviews and special tests.
- (2) Following this evaluation and in consultation with the physician, specific vocational suggestions are made to the patient.
- (3) After the patient has shown an interest and aptitude in an appropriate vocation, his vocational training is begun.
- (4) Before the patient's discharge from the hospital, contacts are made with various agencies in order to accomplish job placement.

9. THE USE OF EDUCATIONAL THERAPY

Often after a proper vocation has been selected for a patient, it is found that certain educational requirements must be met. It is here that educational therapy plays its most important role. In carrying out this function, educational therapy generally institutes the following steps:

- (1) A study of the patient's educational background—If the patient does not have a high school diploma, he is given a battery of five tests, known as the high school general educational development tests, to see if he is eligible for a high school diploma. This is particularly important if his vocational goal is to include further college training.
- (2) The selection of the appropriate courses to be taken—In light of the patient's educational accomplishments and the vocation which has been recommended, an educational program is outlined. There are various facilities which are available to the educational therapist in carrying through such a preparatory program. These include USAFI or Armed Forces Institute courses, individual tutoring, and university extension courses.
- (3) Supervision of the training—It is the responsibility of the therapist to offer continuing guidance to the patient during this work and to arrange for proper examinations in the courses so that, if possible, college credit can be obtained for them.

10. THE USE OF SPEECH THERAPY

Speech is the most important single means of communication, and without it, the socialization of a patient is very difficult. Formal speech training and the correction of speech defects should be carried out only by a qualified individual. All members of the rehabilitation team, however, can stimulate the patient to utilize his speech more effectively by following a few simple rules.

- (1) The patient needs the stimulation of hearing normal language. For this reason, he should be spoken to in a natural manner. Overarticulation, loud talking, or slow talking embarrasses and confuses the patient.
- (2) If the patient appears to have difficulty in understanding, use short, direct, natural sentences.
- (3) Wait for the patient to answer, giving him your full attention and all the time he needs.

Trying to hurry him will create more tension and increase his difficulty.

(4) It is reassuring to the patient to have a listener recognize his disability and show interest in his accomplishment.

(5) When the patient is relaxed and at ease, it is all right to try to get a few specific responses regarding familiar objects with which he is working. The patient should be encouraged in an easy and friendly manner to use the best speech of which he is capable and should not be allowed to get away with a gesture if he can use a word, a word if he can use a phrase or sentence, or mumble a response if he can talk clearly.

The *hospital librarian* can contribute to the speech program, first by careful selection of reading material according to the patient's interest, and secondly, by forming reading groups in which selections of general interest are read and discussed. Naturally, the group must be a selected one for this function. The librarian similarly can increase the morale of patients without speech disabilities.

11. THE USE OF MUSIC THERAPY

It is becoming apparent that music therapy can play a very important role in the social rehabilitation of the disabled patient. There are many ways in which this function can act:

Music appreciation.—Since music appreciation requires no physical participation on the part of the patient, it is one of the best means of introducing the patient to this therapeutic measure. This is accomplished through playing appropriate music during the exercise and dining periods, by having special recorded and radio programs, and through the services of skilled entertainers.

Group participation.—As soon as possible, the patient is encouraged to participate actively in musical projects. Such projects include community singing, group chorus, and small instrumental groups.

Individual instruction.—Individual instruction is generally reserved for patients evidencing particular interest or skills. Patients can be taught to use simple musical instruments despite rather severe disabilities. The accomplishment of this skill offers the patient an additional means of entertainment. Practice on musical instruments may have the added advantage of furthering functional recovery.

Improvement of speech.—Because the basic factors involved in good singing are similar to those involved in good speech, individual singing instructions can augment the speech therapy program. Special emphasis is given to the development of breath control, resonance, pitch control, rhythm, and articulation. (Fig. 35.)



Fig. 35—Singing and vocalizing are helpful adjuncts to speech therapy.

12. THE ROLE OF SPECIAL SERVICES

During the retraining process, which may require a considerable period of hospitalization, the patient is faced with many conflicting emotions precipitated by his need to adjust to the problems facing him. If it were possible to keep these individuals occupied with a medical regime throughout the day, this problem would be largely resolved; but, it is neither practical nor wise to attempt so extensive an exercise program. For this reason and because it more closely resembles the normal routine, an adequate social recreation program is essential. This need is filled by special services and includes such activities as religious, musical, sports, games, and parties.

Chaplaincy service.—By means of church services and individual conferences, the chaplain makes religious experiences available for the patients. In certain cases, the chaplain, by his influence, may aid considerably in obtaining the patient's cooperation in the total program and working out certain of the family problems.

Library service.—Selected reading materials, books, and periodicals can furnish a great comfort, particularly to a bedridden patient. Such reading material can furnish amusement and entertainment as well as educational experiences. The success of such a service naturally will depend upon the skill with which the librarian interweaves it with the rest of the program.

Recreation and sports.—Recreation and sports activities, particularly in this country, have become one of the most important aspects of special services. Such a program, to be a satisfactory complement of the rehabilitation regime, must have variety and must meet the needs but not exceed the capabilities of the patients for whom it is planned. It must be carefully scheduled to avoid conflict with the definitive treatment of the patient and with the programs of the other supporting services. Recreation and adapted sports program includes a great variety of activities such as wheel-chair archery, fly casting or plug casting from a wheelchair, instrumentation, chess, bridge, and photography. Where the disability precludes the full participation in recreational activities formerly enjoyed by the patient, adaptations of such activities can be offered as substitutes. (Fig. 36.)



Fig. 36—Contacts between patients are furthered during unsupervised recreation periods. The card holder was made by the patient to assist him in playing cards.

Canteen service.—The canteen service provides the patient with opportunities for self-expression and for normal social experience “over a cup of coffee” or by means of making gift purchases for his family and friends. It is equally important that a canteen ward cart be available for bedfast patients, and that the canteen store be located in a place that is accessible to semiambulant patients.

13. REHABILITATION CONFERENCE

It is apparent from the above discussion that there are numerous therapeutic influences being brought to bear on the patient. In order to coordinate and to follow the progress of the individual patients, it is helpful to have a periodic patient conference. This conference is conducted by the Chief of the Neurology Service in consultation with the chief, Physical Medicine Rehabilitation, and is participated in by all members of the entire rehabilitation team. This can be done either informally or when indicated, by utilizing the official Veterans Administration Rehabilitation Board.

The patient, as a rule, is presented at this conference a few days after he is started on the program. At this time, the total physical and social evaluation is presented in order to orient the entire personnel with the therapeutic problem. The patient is re-evaluated at subsequent conferences, and his progress as well as his problems are discussed. Reports are given by all the members of the therapeutic team described above. Each member of the therapeutic team is encouraged to participate with questions or suggestions. Each patient, immediately prior to discharge, is again presented to set his course after discharge from the hospital. (Fig. 37.)

14. INTEGRATION AND COORDINATION

In addition to the periodic patient conferences, it is essential to maintain a more intimate integration by



Fig. 37—A weekly conference of the rehabilitation team reviews the patient's progress and coordinates the program.

day-to-day supervision of the various activities. The over-all direction of the therapeutic influences is carried out by the patient's physician. *The success of the progress of any single patient will necessarily depend upon the energy and interest of his physician.* Since it is apparent there is no sharp line of demarcation between the activities of the various therapists, it frequently becomes the duty of the physician to apportion the work in accordance with the individual patient's needs.

In practice, it becomes necessary to schedule the activities of each patient. For such a schedule to become workable, at least some portions of the program must be flexible. For example, because of the individual nature of the treatments in physical therapy, these usually must be scheduled rather rigidly. Corrective and occupational therapy, through group work, permit greater flexibility. It becomes the responsibility of the coordinator to be sure there is no conflict between these various activities and to see that the patient's day is as full as compatible with his general physical condition.

chapter V. SPECIFIC DISABILITIES

1. HEMIPLEGIA

The syndrome of hemiplegia is due to a lesion in that part of the brain that controls voluntary movement. The centers for the control of movement of the right side of the body are located on the left side of the brain. In right-handed individuals, the speech centers are generally located on the left side of the brain. Therefore, when a person has a disease involving the left side of the brain, he frequently will have a paralysis (hemiplegia) of the right arm and leg and difficulty with speech. On the other hand, if he has a lesion on the right side of his brain, he will show only a paralysis of the left arm and leg with no trouble in speech. This can vary from a mild weakness of the arm or leg to a complete paralysis of one-half of the body, depending upon the size and location of the lesion in the brain. Frequently, the arm is more severely involved than the leg and the distal parts more severely involved than the proximal parts.

There are many causes for hemiplegia, varying with the age of the patient. In young individuals, one most frequently encounters infections and tumors; in older individuals, the most common cause is a hemorrhage or a thrombosis, referred to as a stroke. In addition to the above, there are numerous other lesser known causes of hemiplegia. Owing to the multiplicity of causes, it is imperative that each patient receive a careful neurologic examination to determine the specific etiology in each case and the effect it might have on the patient's rehabilitation program.

Following recovery from a stroke, the average patient will have a severe weakness of the arm, leg, or both. Early, this is frequently flaccid but later it becomes spastic. Because of the immobility and spasticity, contractures are a common development, particularly in the shoulder, wrist, hip, and knee. A spas-

tic, inverted foot is an additional common complication.

Due to the brain damage, many patients with hemiplegia show marked emotional instability with frequent tendency to cry in an uncontrolled fashion. This behavior generally improves with the passage of time and intelligent handling, but, in the early phases of the illness, may hinder the treatment of the patient.

The outlook for functional recovery is variable from patient to patient and can be determined only by careful neurologic evaluation from time to time. Long continued flaccidity, the loss of reflexes, and the early onset of contractures are unfavorable signs. The early return of reflexes and function implies rapid and complete recovery. *All patients with hemiplegia, regardless of the degree of recovery, are capable of ambulation if given adequate rehabilitation therapy.*

Because these patients are frequently in the older age group, many are subject to high blood pressure, heart disease, kidney disease, or diabetes. These associated conditions must receive careful attention from the physician at the onset; it is seldom necessary, however, to deny the patient the benefits of rehabilitation because of these conditions.

Immediate care of the hemiplegic patient is thus seen to be chiefly good nursing care and general medical treatment. During the period of flaccidity, it is important to prevent the occurrence of contractures. This is done by passive motion daily through full joint range and proper positioning in bed. Generally, the patient is kept quiet in bed; careful attention is given to the skin, mouth, bladder, and bowel. Medical procedures and therapy for underlying disease, if not started on arrival at the hospital, are now begun.

The nursing care of these patients is of utmost importance. They must be carefully watched for evidence of exacerbations of their condition. The paralysis of the extremities leaves the patient quite help-

less for a time, and he must be fed and encouraged to begin feeding himself as soon as possible. Decubiti are avoided by close attention to maintenance of skin hygiene, chiefly through preventing the patient from soiling himself while incontinent. During this early period, he is placed on a schedule for eating, bowel habits, waking, and sleeping. The nurse's encouragement of the patient to help himself in her initial contact with him is the first step in rehabilitation.

Social service is notified as soon as possible after admission, and then interviews the patient's family. At this time, the general aims of the program are outlined to the family, and an estimate is given as to how long it might be until the patient is ready to return home. Any financial or social problems resulting from the patient's illness are discussed, and the family is encouraged to use Social Service facilities to the fullest extent. The social worker also begins her attempts to orient the patient as soon as his condition permits. Her contacts with both the patient and the family continue through the entire hospital stay.

Since most hemiplegics are kept in bed for a period of 3 to 6 weeks depending upon the severity and cause of their involvement, it is necessary to begin physical therapy on the affected limb as soon as the acute symptoms have subsided and while the patient is still bedridden. At this stage, physical therapy consists of prevention of deformity by the use of passive movement through the full joint range. Between therapy periods, footboards and sandbags may be used to hold the foot at a right angle and to prevent external rotation of the thigh. In selected cases, posterior splints may be substituted. Light cock-up splints may be indicated for the hand and wrist. As he improves, he is taken to the physical therapy department where active assistive exercises and muscle training are begun. The patient is encouraged to use the affected extremity as much as possible and to care for his own bedside needs. In physical therapy, heat, massage, and hydrotherapy may be used for painful extremities and joints. These procedures prepare the patient for corrective therapy.

In corrective therapy, the patient is exposed to more vigorous exercise and group activities. Since the chief goal is ambulation, resistive exercises and pulley therapy are begun early. (Fig. 38.) Ambulation is started when the patient is strong enough to bear weight on the affected limb. He usually starts by balancing within the parallel bars and progresses through the normal stages of ambulation described in previous



Fig. 38—Resistive exercises for strengthening the quadriceps are frequently helpful in hemiplegics, particularly if any contracture has developed.

chapters. During this period, he is taught the necessary self-care activities.

When the patient is not at physical or corrective therapy, he is encouraged to participate in occupational therapy. Woodworking, braiding, finger painting, and clay modeling offer excellent exercises for the development of the hemiplegic hand and wrist while the bicycle, jigsaw, sewing machine, and similar treadle apparatus are used for the development of the foot and ankle. (Fig. 39.)

The speech therapist is requested to see the patient when speech difficulty (aphasia) is present. The patient is encouraged to use his language residual as much as possible. Materials are provided by the therapist for retraining and expansion of the limited function. The course of speech therapy is often much more prolonged than any of the other rehabilitation procedures and frequently must be continued after the patient has left the hospital.

Because of their disability, many patients have to learn new vocations which will enable them to contribute to the support of the family. In younger individuals, this prevocational training is begun in the hospital, and contacts are made for him to continue his training after discharge. In the older individuals, it is frequently necessary to be satisfied with home craft or an avocation. (Fig. 40.)

In every patient, prior to discharge, the minimum goal should be self-care and moderate ambulation.



Fig. 39—Supports can be used in occupational therapy to eliminate the effect of gravity and friction on the weak muscles.



Fig. 40—Photography is an excellent vocation or hobby for a hemiplegic patient.

2. ATAXIAS

The syndrome of ataxia may be due to involvement of the cerebellum or to involvement of some of the special tracts in the spinal cord. Such an involve-

ment manifests itself upon the arm and leg of the same side. In such a patient, there develops an incoordination of the involved limbs resulting in awkwardness in gait, clumsiness in the hands, and, in many cases, slurred speech. Tremor may be an associated finding. Many of the ataxic patients also have varying complements of spasticity.

The spinal types of ataxia are due to such diseases as pernicious anemia, tabes dorsalis, and multiple sclerosis. Cerebellar ataxia may be due to tumors, injuries, thromboses, and degenerations. Most of these diseases tend to be progressive, but many of them have prolonged periods of remission. Therefore, it is very important to get a careful evaluation of the patient and the cause of disturbance prior to the institution of therapy. In spite of the general unfavorable outlook in this group of conditions, many patients show considerable improvement under a retraining program.

In contrast to the hemiplegic patients, the ataxias are much more chronic disabilities and rehabilitation can be instituted as soon as the evaluation of the patient is completed. The general principles of retraining of these patients consist of substitution activities. Because of the loss of the coordinating mechanism, the patients have to compensate by substituting other senses, such as sight. Such a substitution requires the conscious concentration of the patient and therefore necessitates a prolonged period of retraining. Even after such retraining, slight emotional upsets may temporarily disturb the newly acquired compensations and again precipitate the incoordination. Such emotional overreactions may appear to be very insignificant such as being amongst company, boarding a streetcar, or undertaking a new activity.

The nursing care of these patients consists chiefly in protecting the patient against bodily injury, from falls, cutting himself, etc. The nurses must also expend considerable effort in teaching these patients self-care activities.

These illnesses, because they are chronic and progressive, generally have been present some time before the patient applies for rehabilitation. As a result, the patient and the family have already made certain and often unhealthy psychological adjustments. It is the primary duty of the social worker, once a medical evaluation and goal has been set, to attempt to develop a healthier family relationship.

Since hypotonia is a common accompaniment of these disorders, contractures are uncommon and

passive movements are generally not required. The chief purposes of the exercise program are to develop muscle power, coordination, and endurance. The development of muscle power is accomplished by resistive exercises and general reconditioning exercises. Retraining in coordination is carried out by modification of Frenkel's ataxia exercises. Stabilization of the elbows against the body is a useful compensation in reducing incoordination of hand movements. Endurance is built up by constant repetition and perseverance in the exercises and activities. Since, in these patients, the bulk of the physical exercises can be carried out on a group basis, they generally fall into the realm of the corrective therapist. Muscle testing and muscle re-education are likewise important for this type of patient, and, as each is usually different in extent of involvement, individual treatment is indicated as prescribed. (Figs. 41 & 42.)



Fig. 41—Block placement exercises develop coordination in the upper extremities.

Occupational therapy generally supplements the general exercise program. One usually should start with group activities and proceed to those requiring finer movements. The patient should be protected against frustration and personal injury. Activities which may result in tearing, spilling, breaking, etc., should be avoided. One may employ braid weaving and the use of floor looms. Woodworking is excellent for the rhythmic repetitive motions involved. Finally, one can progress to the use of plastic and leatherwork. Gardening is a very excellent exercise for these patients and has the additional asset of getting the patient outdoors.



Fig. 42—Handrails installed in the home make it possible for the severely ataxic patient to go up and down stairs, making him more independent in his own home.

The purpose of speech therapy in the ataxic patient is to make the speech as intelligible as possible and to reassure the patient that it is understandable. This can be accomplished by training the patient to speak slowly and to pronounce his words as carefully as possible. It is frequently helpful to have the patient pause after every word or every phrase. Specific speech drills are indicated in selected patients. The patient must be taught to understand and accept the changes which have occurred in his speech and to develop an objective attitude toward his speech problems. Understanding and tolerance on the part of the listener often goes a long way in the development of speech confidence in the ataxic patient.

Vocational training follows the same general principles as for any other chronic neurologic disorder and will be limited only by the severity of the disability and the progressions of the illness.

3. MULTIPLE SCLEROSIS

Multiple sclerosis affects scattered and multiple portions of the nervous system. Some of the cases are spe-

cifically hemiplegic; others closely resemble paraplegias. The majority of them, however, have a combined ataxia with spasticity. The treatment problem will depend upon the predominant involvement, be it ataxia or hemiplegia. Their treatment has been detailed in the two previous sections.

Multiple sclerosis, however, does present a special problem because this disease has a tendency in many cases to exacerbations and remissions and is most frequently seen in the younger age groups. Because of the remissions and exacerbations, the course of the disease is extremely variable and unpredictable from patient to patient. This requires repeated re-evaluations of the patient in order to fit his rehabilitation program with his needs, and to keep the plan fluid so that it can be readily changed. There are certain general rules in the handling of multiple sclerosis.

During the acute relapse, it is probably advisable to avoid an intensive exercise program. Even though such a program may not be deleterious from a physical point of view, it is better psychologically to begin the exercises after the patient has leveled off. It is important, however, to prevent deformities and to carry out at least diversional occupational therapy during this acute stage.

As soon as the patient's condition has leveled off, it is important to begin the appropriate exercises with as little delay as possible. At the same time, the occupational therapy should be converted from diversional to functional activities.

One must keep in mind, however, that even in the most unfavorable type of case where the disease tends to take a fairly progressive course, this progression is usually slow and a great deal can be done to improve the function and adjustment in the majority of these patients.

A large number of drugs have been used in the treatment of this disorder. These include quinine, fever therapy, vitamins and liver, vasodilators, and anticoagulants. The remissions and relapses characteristic of this disease make their evaluation difficult. Controlled studies seem to show no significant difference between the effects of any of these drugs and of placebos. However, many individual patients feel that one specific drug has been of benefit to them and, for psychotherapeutic reasons, it is often important to supplement the exercise program with the drug. Under these circumstances, until a proven effective drug is found, the use of a simple, nontoxic medication is advisable.

4. PARKINSONISM

Parkinsonism, or shaking palsy, is a disease which manifests itself primarily by muscular rigidity which often is associated with a tremor. Because of the muscular rigidity, these patients may demonstrate marked slowness of movements and a hesitant speech. Generally, this is a slowly progressive disease lasting over an extended period of years and more commonly affecting the older age groups. If not handled properly, this illness frequently will lead to complete invalidism. The two main causes for this illness are arteriosclerosis and encephalitis, the latter generally affecting the younger age groups.

The treatment of these patients is a combination of the intelligent use of drugs, exercise, and emotional readjustment. Since there are, at the present time, many drugs which greatly aid in reducing the rigidity of these patients, drug therapy must be the first consideration. (Fig. 43.)

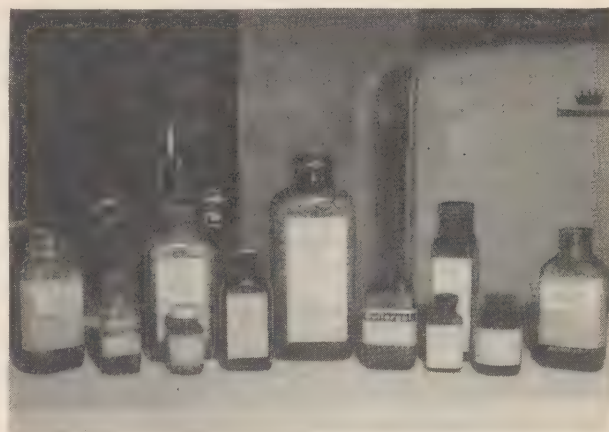


Fig. 43—Because of the large number of drugs available and their varying effects in parkinsonism, each patient must be individually evaluated.

The principal drugs are hyoscine, rabellon, vinobel, and bella bulgara. Drugs such as benzedrine, prostigmine, dial, and quinine may be used as adjuncts. As a general rule, these drugs are much more effective against the rigidity than against tremor. The patients vary tremendously in their tolerance to those drugs and, therefore, the therapy must be highly individualized to obtain the maximum results.

While the patient is being regulated on his medication, one proceeds with the other forms of treatment, such as retraining and emotional readjustment. The latter requires considerable attention from the physician throughout the entire course of therapy. These

patients tend to follow a set routine and are resistant to change. They tend to become dependent upon others and are commonly subject to mild depressions. These personality traits are of great importance in the treatment of the patient and must be modified before adequate results can be obtained.

Such results are obtained through the combined efforts of the physician with the help of the social worker. Because this disorder is of long duration, there is a marked tendency for families to reject the patient while the patient, on the other hand, becomes more and more dependent upon others for his care. Both these difficulties can be greatly improved by constructive social work.

Because the upper limbs are more frequently involved than the lower extremities, the condition affects self-care activities much more than ambulation. For this reason, the chief nursing problem is daily training in self-care activities. It is important that the nurse follow closely the medical regime prescribed by the physician but, since the patients may be resistant to changes in their medication, it taxes the ingenuity of the nurses to carry out the doctor's orders. (Fig. 44.)

The chief role of physical therapy in the treatment of parkinsonism is to attempt to break down contractures and increase joint mobility. In the more chronic cases, in which swollen, painful joints and extensive edema have developed, heat and passive movement may prove of definite benefit.

Most of these patients score well on ambulation; however, they do have considerable difficulty in getting in and out of chairs, up and down stairs, and rolling over in bed. For this reason, truncanal exercises on the mat, sit-ups, and calisthenics in cadence are given. (Fig. 45.)

Work in occupational therapy is impaired by these patients' postural difficulties and stiffness of the hands. One of the first therapeutic aims is that of achieving good working fists. This can be accomplished by weaving, woodworking, and especially hammering. Leatherwork forms a more advanced project. (Fig. 46.)

The statements made concerning speech therapy in ataxic patients are directly applicable to patients with Parkinson's disease. The actual type of speech defect is somewhat different but the method of handling is essentially the same.

Very mild parkinsonisms under adequate therapy may achieve, for a time, a full vocational adjustment. Since this illness is a progressive one, however, eventu-



Fig. 44—Even in the presence of severe tremor, an electric shaver will make it possible for the parkinsonism patient to shave himself.



Fig. 45—Exercises for truncanal rigidity can be carried out in a group by mat calisthenics.

ally most of these patients have to resort to avocations or hobbies. Craftwork and gardening are excellent in this respect.

5. FLACCID PARALYSIS

Flaccid paralysis, in contrast to the previously described conditions, is characterized by weakness or paralysis of individual muscles or muscle groups fre-



Fig. 46—Occupational therapy for parkinsonism frequently includes the use of the loom.

quently resulting in a flail limb. This condition usually is associated with a rapid and severe degeneration, resulting in marked atrophy of the involved muscles often associated with severe tenderness and skin changes.

A flaccid paralysis is found in a large number of conditions such as cord injuries, peripheral nerve injuries, poliomyelitis, Guillain-Barre's syndrome, muscular atrophies and dystrophies and multiple neuritis. The distribution of the paralyzed muscles will vary greatly according to the cause of the disorder, the severity of the illness, and the location of the involvement. The amount of involvement may vary from an isolated paralysis of one or two muscles to involvement of an entire limb or even to the paralysis of all four limbs.

The requirements for rehabilitation vary according to the nature of the muscular involvement; for example, lower extremity involvement severely impairs ambulation while upper extremity involvement more severely impairs self-care and vocational activities. The outlook for recovery in a flaccid paralysis will vary from patient to patient and can only be determined by careful neurologic examination from time to time.

Acute stage.—During the *acute stage*, the immediate treatment of the patient will depend upon the cause of the illness. If the lesion is due to an injury, bed rest is not usually necessary for the paralysis, but surgical consultation or treatment may be required. Indicated surgical treatment might be the repair of cut nerves or the reduction of fractures or

dislocations which are pressing upon the peripheral nerves. If the disease is infectious in nature, the immediate care consists of bed rest, good nursing care, and daily passive movement through full range of motion.

Nursing care is of primary importance both for the protection of the involved limb and for the comfort of the patient. Freedom from pressure can be accomplished by use of footboards, a cradle over the limbs, pillows placed in the proper position, or the use of splints correctly fitted for the patient's disability. In involvement of the feet or hands, elastic or spring splints are of value.

The nurses should be alert to prevent contractures, and should not allow the patient to assume or maintain improper positions in bed. If trained therapists are not available, the nurse should carry the joints through the full range of motion at least once daily. The patient should be encouraged to change position often. Those who are unable to do so themselves should be moved frequently and gently.

The nurse should also pay particular attention to the patient's skin to prevent its break-down, particularly over the bony prominences. Early in the course, the patient must be discouraged from too great activity and too many visitors. His surroundings should be kept quiet and cheerful.

When the paralysis involves the upper extremities, it is necessary to observe the patient carefully for any signs of possible paralysis of the throat or chest muscles manifesting itself in difficulty in breathing or swallowing. In such cases, emergency equipment such as suction machine, tracheotomy trays, and respirator should be conveniently available. Oral medication should be avoided, and the diet should be liquid or soft. At all times, the nurse's approach to the patient should be one which will build confidence and allay anxieties.

Physical therapy should be started early when the patient is still confined in bed. The object is to prevent contractures and maintain the paralyzed muscles in the best possible position. Denervated muscles are protected against the constant pull of gravity or of their antagonists. The effects of immobilization are combatted by daily passive movement through full joint range. Where pain is present, some form of mild heat provides relaxation and facilitates passive movement. Heat may be applied by any of the standard means. Massage, when used, should be gentle. (Fig. 47.)



Fig. 47—An infrared lamp furnishes a good source of heat in cases of flaccid paralyses.

Subacute stage.—In the *subacute stage*, the patient has recovered from the immediate effects of his acute illness and should be ready for more active measures. As voluntary muscle power returns, active assistive exercises replace the passive movement. The patient is permitted to assume mild active or free exercise as he is able to tolerate it. Too early or too intensive active exercise may retard the patient's recovery. During the period of active exercise, muscle re-education begins, and is continued until the muscle power is sufficient to carry the affected limb through complete range of motion with gravity eliminated. In some muscle groups, adequate voluntary power is never regained. If there is severe paralysis which does not recover, it is useless to continue with muscle re-education indefinitely; the patient must be taught substitution methods similar to the training of the paraplegics.

Concomitantly with the muscle re-education (fig. 48) the patient is referred to the corrective therapist, who teaches him self-care and preambulation activities. Sitting posture and balance are taught, increasing the sitting time to over 1 hour before the patient

is taken to the corrective gymnasium for light mat exercises. About this time, progressive resistive exercises of the lower and upper extremities are cautiously applied to a point just short of fatigue. The patient then progresses to standing and weight shifting in the parallel bars, concentrating on good posture. From this stage, he progresses through the usual stages of ambulation which have already been discussed in detail.

In view of the dangers of overfatigue of the involved muscles in flaccid paralysis, the occupational therapist must regulate the program very carefully in this type of disorder. The beginning activities generally are adapted for the elimination of gravity, beginning with suspension slings or powder-boards. As the patient's tolerance increases, the problem then is one of building up increased muscle power by graded exercise. Activities must be chosen which will provide exercise only to the affected muscles while avoiding strengthening unaffected muscles.

It is important to watch for compensation or substitution of an unaffected muscle group on the part of the patient. It is only in the chronic stage that such substitution activities are encouraged. Various forms of hand weaving, cord knotting, clay modeling, drawing, and finger painting can be used as first projects in the treatment of the upper extremities while the bicycle, jigsaw, looms, and other treadle



Fig. 48—In flaccid paralysis, active assistive exercises require considerable individual attention by the therapist.

equipment are used for strengthening of the lower limbs.

Chronic stage.—Generally, the chronic stage in a flaccid paralysis can be considered to begin about 9 months after the onset of the disease. By the utilization of modern diagnostic means, it is possible by this time to estimate with reasonable accuracy the amount of recovery from paralysis which can be expected. The exercise program for those parts which promise further recovery continues along the lines indicated above. The required substitution for self-care and ambulation are usually well started by this time, and one can now make plans for the social and economic readjustment of the patient.

At this stage, the social worker plays an increasingly important role by preparing the patient for the transition from the hospital environment to society. Vocational guidance, prevocational testing, and educational retraining must all be brought into play at this point if the patient is going to make an adequate social and economic adjustment after being in the hospital.

6. PARAPLEGIA

Paraplegia customarily refers to a paralysis of the lower limbs associated with impaired control of the bladder and bowel. The classical cases are the result of a widespread destruction of the lower part of the spinal cord, usually from injury and less commonly from tumors or infections.

Since the problems involved in the rehabilitation of the paraplegic are special ones and since special centers have been established for their care in the Veterans Administration, the present discussion will be limited to immediate care prior to the transfer to such centers. Such immediate care consists of the carrying out of indicated surgery, the care of the skin, bladder, and bowels, prevention of contractures, and the preliminary strengthening of the upper extremities as a prerequisite to ambulation. (Fig. 49.)

Indicated surgery.—Great difference of opinion exists among neurologists and neurosurgeons regarding indications for operative interference and the time when operation should be done in the traumatic paraplegics. Many believe laminectomy is indicated as soon as primary surgical shock has disappeared; others believe in waiting 4 to 5 weeks. Most surgeons agree that if symptoms indicate a partial cord lesion, if X-rays reveal dislocated bone fragments or presence



Fig. 49—An evaluation by the doctor of the cause, severity, and outlook of the paraplegic is essential before rehabilitation procedures can be applied intelligently.

of a foreign body causing pressure on the cord, and if spinal tap reveals a block, an open operation is indicated. Operations in which symptoms and signs of a complete transverse lesion exist rarely prove of any benefit. Occasionally surgery will cause an incomplete lesion to become complete.

Care of the skin.—When the lower part of the cord is damaged in paraplegics, there is a greater tendency toward development of bedsores. The skin will macerate quickly when wet and, therefore, should be kept scrupulously clean and dry. Bed linen should be changed at once in case of soiling. The tissues around bony prominences, such as the feet and knees, should be protected by large pads securely but loosely wrapped with Ace bandages. When the patient is lying on his back, large pads and small pillows should be placed beneath him to relieve pressure. The bedpan should be padded and under no circumstances should a chipped bedpan be used for this type of patient.

The decubiti are preventable in most cases; should they occur, they must be kept scrupulously clean and free from contamination. These patients must be turned at least every hour in order to avoid pressure on the bony prominences and pulmonary congestion. This may be accomplished by various methods. A draw-sheet may be used, thereby eliminating any possible abrasion or bruising to the skin by dragging or from pressure. Some patients may be placed on a Stryker or a Bradford frame to facilitate their turning and handling. As soon as possible, the patient must

be taught how to turn himself without producing injury to his skin.

Care of the bladder.—All severe lesions of the lower cord will cause acute urinary retention and necessitate immediate catheterization, preferably with constant drainage. Details of special bladder care will be discussed in detail in chapter VI, section 4.

Care of the bowel.—During the acute stage, the patient frequently develops paralysis of the bowels which will manifest itself in abdominal distention and obstinate constipation. This requires the use of repeated enemas and of various drugs such as pitressin, prostigmine, and the like. Bowel habits can be re-established by the use of daily enemas given at the same hour each day.

Many spinal cord injuries develop marked nutritional deficits, especially in the presence of bedsores and urinary infections. These patients generally require a daily minimum of 3,000 calories and 150 grams of protein. High doses of vitamin supplements are indicated. Transfusions should be given if anemia exists. Infections are treated by appropriate chemotherapy.

Prevention of contractures.—Contractures may be prevented by placing the patient's extremities in good anatomical position. Sandbags, pillows, and splints are useful to maintain position. Footboards will help prevent foot drop. The nurse, in giving general bed care to these patients, usually can continue passive ex-

ercises to supplement the treatment given by the physical therapist.

Strengthening of the upper extremities.—Strengthening of the upper extremities is essential to the rehabilitation of the paraplegic patient. It is begun early and continued until his transfer. The exercise program includes a limited number of movements, all of which are calculated to improve the strength of those muscles necessary for crutch walking. Resistance is added progressively to obtain the maximum possible muscle power. (Fig. 50.)



Fig. 50—Short crutches are used to strengthen the upper extremities preparatory to ambulation for the paraplegic.

chapter VI. SPECIAL PROBLEMS

1. DIAGNOSTIC PROCEDURES

In following the course of the neurologic patient on rehabilitation, certain supplementary diagnostic procedures are required. They are, with some exceptions, the same as used in examining and evaluating the acute neurologist patient. Aside from the general neurologic examination, some of the procedures follow:

Cranial roentgenography.—X-rays of the skull are almost routine in any neurologic patient showing brain symptoms such as the hemiplegias, the ataxias, and the parkinsonisms. In some patients tending to show progressive symptomatology or seemingly not responding properly to a program of rehabilitation, however, it is frequently necessary to recheck the X-ray of the skull and to augment such rechecks with special X-ray procedures. Ventriculography and pneumoencephalography consist of injecting air so that the brain itself rather than the skull can be visualized by X-ray. This procedure is particularly valuable in differentiating between cases of tumors and progressive degenerations. Angiography is a procedure or method in which the blood vessels of the brain can be visualized by X-ray after they have been injected by an opaque dye. This procedure is of particular value in cases of vascular abnormalities affecting the brain.

Spinal roentgenography.—X-rays of the spine are particularly useful in cases of flaccid paralysis, paraplegia, and in patients in the older age group who, during the course of the retraining program, complain of pains in the back. Under these circumstances, standard X-rays of the spine may show fractures, dislocations, tumors, or arthritis. If the standard procedures do not offer adequate information, myelography with opaque oil may be indicated. This medium fills the spinal canal and brings into view abnormalities, such as adhesions or tumors.

Spinal fluid.—The repeated examination of the spinal fluid is of value in all forms of neurological disabilities. It is of particular importance, however, in following the course of neurosyphilis and spinal cord tumors. (Fig. 51.)

Electroencephalography.—Electroencephalography is a relatively recent procedure for study of the electrical activity of the brain. This procedure is particularly useful in establishing the presence of convulsive disorders and tumors. In following the course of patients suffering from injuries, infections, and vas-



Fig. 51—A spinal puncture by the doctor frequently yields important information as to the underlying illness.

cular disorders, the electroencephalogram will often indicate whether the disease is progressing or returning toward normal.

Miscellaneous laboratory procedures.—There are a number of laboratory procedures which are useful in following the patients undergoing a prolonged hospitalization: (1) Hemoglobin, plasma protein, and blood urea nitrogen should be done at regular intervals, particularly in the presence of edema, in bed patients; or patients who are deteriorating physically; (2) repeated urinalysis should be routine for all patients.

2. PSYCHOTHERAPY IN REHABILITATION

The value of suggestion, reassurance, and encouragement from the physician in the treatment of physical disorders long has been known. The value is so unquestionable that discussion is hardly necessary. In any well-planned and active therapeutic program the patient's ability to respond to increased hope and optimism is a valuable adjunct. (Fig. 52.)

Group influence.—When a patient enters a rehabilitation hospital, he should be impressed by its efficiency, friendliness, and optimism. There should be little delay in outlining the treatment program for him, in starting his pretreatment work-up, and in his actual participation in the program. The value of being able to place this patient with others who have been

under treatment for some time is important; from his fellow patients, he is able to derive encouragement and hope. To see others who have troubles similar to his own will help him overcome one of the most difficult and discouraging features of severe invalidism. Group morale is a motivating factor.

Individual and family influence.—A complete analysis of features of the illness is a necessity, as often problems not related to the actual physical incapacity may make it impossible for the patient to feel eagerness to improve. Interviews with adequately trained social-service workers, preferably those with training in psychiatric social work, is a necessity. The social worker should contact the relatives of the patient whenever possible. Adequate plans for the future are important. The situational anxiety accompanying any illness is frequently most severe with neurologic handicaps. This can be attributed to the attitudes of all of us toward our bodies, and the things which these bodies have always done for us before. To be an obvious cripple is difficult to accept. The obviousness of the illness makes one much more aware of the attitudes of others, and gives one the feeling that he cannot now be accepted into the same social groups as before. Hospitalization helps the patient to adopt a new attitude toward his handicap.

Patient's reactions.—In a patient having difficulty adjusting to his neurologic disability, there are two fundamental types of reactions—defeatism and hostility. In both cases, the illness is utilized to assist the patient solve long-standing personality problems. In defeatism, the patient uses his disability to fulfill a long-standing desire to cease competing in his environment. Under such circumstances, the patient becomes dependent upon others, lacks initiative in the program, and is slow in making discharge plans.

Many patients will respond to the routine procedures described above. The social and family aspects are very important in that it is frequently necessary to manipulate the environment through the patient's relatives. On occasions, individual psychotherapy interviews are required. As a final resort, it may be necessary to adopt a firm attitude toward the patients.

In the hostility reaction, the patient becomes very resentful at having become disabled. Many times, this resentment becomes fixed upon the paralyzed part itself and thus interferes with any progress the patient may make toward improvement. Therapy is directed at getting the patient to accept his disability in a realistic manner and therefore must be highly individual-



Fig. 52—Every disabled person has emotional problems which must be worked out on an individual basis.

ized. The realization that other people are suffering from the same disabilities helps some with these patients. Individual interviews usually are required and frequently must be carried out by a trained psychiatrist. Once these patients have directed their aggressiveness into getting well, they many times apply themselves with greater than average energy and therefore progress very rapidly.

Other emotional problems, such as conversion reactions, post-traumatic reactions, and compensation reactions, require individual attention and usually specific psychiatric management.

3. PSYCHOLOGICAL TESTING

In the psychological examination of patients on the rehabilitation program, there are three general areas which must be investigated: (a) the level of intellectual efficiency; (b) the amount and type of deterioration; and (c) the emotional and personality make-up of the individual. In addition, it is important to consider the effects that blindness, aphasia, or paralysis of the preferred arm may have in evaluating the psychometric tests. Examination of such patients should never be a matter of a routine battery of tests; therefore, it seldom can be accomplished satisfactorily by a disinterested and uninformed psychologist. If the results of these psychological tests are to be useful in facilitating the work with the patient, they must be reported in terms understood by all members of the rehabilitation team. In general, psychological testing is desirable in the original evaluation of the patient; however, it achieves its greatest usefulness in uncovering factors which are interfering with the recovery of the patient and slowing down the progress of his rehabilitation.

The intellectual sphere.—The intellectual sphere is examined by well-standardized tests such as the Bellevue-Wechsler scale and Stanford-Binet 1937 scale. The former is an excellent scale for the upper levels of mental ability while the latter is standardized at lower levels; hence, the two tests are not directly comparable. There are, in addition, paper and pencil tests, such as the Otis test, which are seldom satisfactory for use with handicapped patients.

Deterioration.—It is extremely difficult to estimate clinically the degree and type of intellectual damage without the use of psychometric tests. The chief reason for this difficulty lies in the fact that ordinary clinical judgment is based upon such functions as comprehension, vocabulary, and range of information

which may be relatively unimpaired. Psychometric evaluation will give information concerning the following: Abstraction, relearning ability, calculations, and ability to shift quickly from one concept to another; these are frequently severely impaired in patients with brain damage. At the present time, there are a number of specific tests for organic brain damage, such as the Hunt test, the Weigl-Goldstein-Scheerer test, and the use of the subtests of the Wechsler-Bellevue.

Personality.—The Minnesota Multiphasic Personality Inventory offers a simple and effective evaluation of the patient's emotional adjustment. In addition, there are a number of other tests which may be applied to selected cases, such as the Thematic Apperception test, Stein's Sentence Completion test, and the Rorschach test. (Fig. 53.)



Fig. 53—Special psychologic tests, such as the Minnesota Multiphasic Personality Inventory, are helpful in uncovering emotional problems and assisting vocational guidance.

4. CARE OF THE URINARY BLADDER

Because of the type of disabilities encountered and the age of the patients, the care of the urinary bladder is of extreme importance in the treatment of neurologic disabilities. The objectives sought in the care of the urinary bladder are (1) the ability of the patient to void through an intact urethra, (2) the maintenance of a bladder capacity of 200 to 400 cubic centimeters, (3) the ability of the bladder to empty itself completely, and (4) sufficient bladder control to avoid incontinence. The methods of obtaining these objectives can be broken down into several stages.

Immediate care.—Immediate care, particularly in traumatic cases, generally involves the use of a

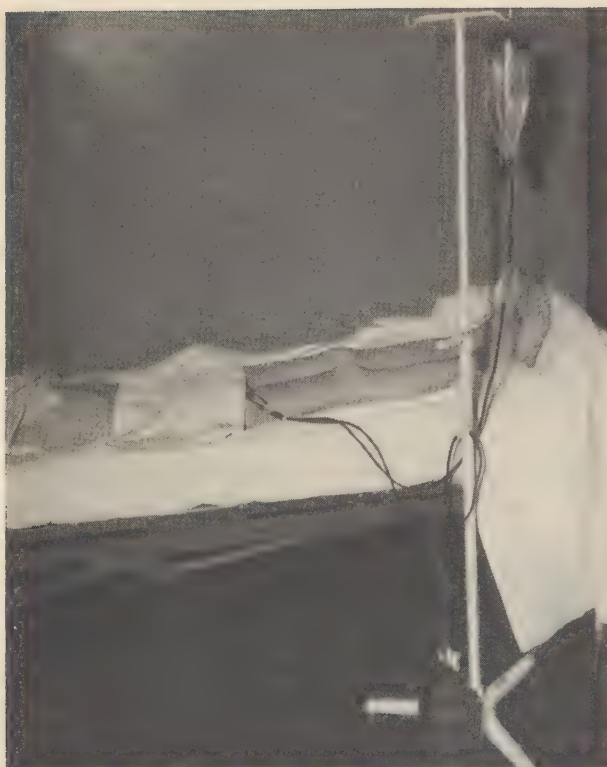


Fig. 54—A dependent loop in the tubing may interfere with the proper functioning of continuous-flow bladder irrigation.

catheter to prevent overdilation of the bladder and to avoid incontinence, resulting in a wet bed. Intermittent catheterization is generally unsatisfactory in these patients. For continuous drainage, an indwelling catheter, preferably of the Foley type, should be connected with a sterile closed drainage system. The catheter should be removed once weekly and should be left out for several hours to permit the drainage of urethral secretions. At this time, any progress in voiding can be observed. For irrigation of an indwelling catheter, one may use the tidal method, the continuous drip, or intermittent irrigation. The latter has the advantage of allowing the patient himself to participate in his bladder retraining during the initial stages. Complications encountered are chiefly infections and calculus formations. These may be combatted by the use of chemotherapy, special irrigating solutions, and by early ambulation. Fluids should be forced to at least 2,000 to 3,000 cubic centimeters daily. (Fig. 54.)

Incontinence.—When the patient is being taken off catheter care, incontinence may become an important problem. There are several methods of handling this,

none of which are without certain disadvantages. Methods in common use include a condom or penrose drain fitted over the penis, the use of metal or rubber urinals in place, and the use of a penile incontinence clamp. In all of these, the problem of infection and decubitus ulcerations must be carefully guarded against.

Bladder retraining.—Bladder retraining works best in patients with intact abdominal musculature such as occurs in lesions of the lower portion of the spinal cord. These patients are taught to assist the emptying of the bladder at regular intervals by abdominal straining which may be augmented by manual pressure over the lower abdomen. In lesions of the upper cord, automatic reflex bladder emptying frequently develops but tends to be inefficient. Surgical intervention should be considered in all cases which do not respond adequately to retraining methods. Such cases require study by a qualified urologist.

5. NURSING CARE

The nursing care in patients with neurologic disabilities presents certain problems which differ from those of other types. This is true because neurologic patients may be comatose, paralyzed, have areas of anesthesia, lack control of bowel and bladder, or may have convulsions. The above factors produce a problem in the care of the skin.

The care of the unconscious or irrational patient first requires measures to prevent self-injury. Many of these patients need sideboards on the beds and some will require restraints. During this stage, it is necessary to change the position of the patient every 1 to 2 hours to prevent the development of pneumonia, contractures, and decubiti. Determinations of blood pressure, pulse rate, respiration, temperature, and state of consciousness are taken at regular intervals, varying from every half hour to every 4 hours. An adequate airway is maintained by using postural drainage or mechanical suction for the nasal and oral secretions. Intake and output are recorded accurately during this stage.

The problem of paralysis makes it difficult for the patient to take care of his daily needs, including turning himself in bed. Because of the paralysis and numbness, special attention must be paid to the care of the skin and the prevention of decubiti. Proper bed posture must be maintained as discussed in an earlier chapter. Footboards are routine on such patients to prevent pressure from the bedclothes.

Patients with areas of anesthesia require special attention because they are unable to recognize when undue pressures to the skin are occurring. The areas of anesthesia often are associated with changes in circulation which make these patients more susceptible to burns. For these reasons, special attention is paid to be certain that any heat applied to anesthetic patients is mild and runs no risk of burning the patient.

Care of the bladder is discussed in section 4 of this chapter. The care of the bowels is discussed in chapter V, section 6.

The care of the skin requires attention to all of the features described in the preceding paragraphs. The general principles to be followed are frequent turning of the patient, the avoidance of wrinkled bed linens, and scrupulous cleanliness in the care of the bowels and bladder. A daily bath with light massage and an alcohol mineral oil rub stimulates the circulation and tends to harden the skin. Ventilation of the skin of the patient prevents maceration from sweating. In most of the cases, decubiti can be prevented; however, if they do occur, the above measures are intensified and the patient is placed on a diet which is high in protein, vitamins, and caloric intake. Numerous topical applications have been recommended but seem of less value than exacting nursing care. A daily bath in a warm, continuous-flow tub cleanses a decubitus ulcer, appears to stimulate circulation, and reduces the pressure by tending to float the patient. In severe cases, plastic surgery is indicated even in the presence of mildly infected granulation tissue. Such plastic procedures may markedly reduce the time required for healing.

The immediate care of the patient with a convulsion is directed toward prevention of injury. This includes the placing of a tongue blade between the teeth and the general protective measures for an unconscious patient. In addition, it is important to observe and record in detail the onset and various manifestations observed during the convulsion.

6. ORTHOPEDIC APPLIANCES

In general, the application of orthopedic appliances to the neurologic patient is based on a few fundamental designs modified to support, actively or passively to splint, or to prevent deformity of the involved part of the patient. Personnel actively engaged in rehabilitation need to understand the basic principles of splinting and their modifications so that they may instruct the brace maker as to construction of the de-

sired appliances. Often a physician or surgeon can greatly improve the chances for rehabilitation of a neurologic patient by including the brace maker as a part of the team in rehabilitation. Details of specific construction of various types of orthopedic appliances can be found in the literature. The indications and types of surgical procedures which can be utilized are too varied and numerous for discussion within this monograph, and evaluation for this type of therapy can best be determined by orthopedic consultation as indicated for each specific case.

Knowledge of conservative orthopedic methods, however, is of definite value for personnel actively engaged in rehabilitation programs. Application of well-constructed and properly fitted appliances is essential for the following purposes:

- (1) To prevent skeletal deformities. Appliances of this type must be used for prolonged periods of time.
- (2) To supply rest for an extremity or back, preventing pain and muscle spasm.
- (3) To correct a deformity becoming fixed. Appliances must be constructed so as to apply corrective forces.
- (4) To restore locomotive function of the skeletal system by continued motion of joints and maintenance of available muscle tone and other functional factors in motion.
- (5) To improve skeletal function by application of a brace or splint, substituting for loss of muscle power across a joint, giving stability, and enhancing remaining muscle function.

Some of the more important appliances used on the neurologic rehabilitation service consist of casts, splints, traction devices, and braces.

Casts.—Casts are used most commonly in neurologic disabilities when there is a complicating fracture.

Splints.—Splints may be plaster, plastic, or metal and are used to provide rest to joints and to prevent deformity. They are constructed so that the part may be removed readily to permit the application of massage, passive movement, and other types of therapy. They are used chiefly during the preambulatory stage but may be applied at night to an ambulatory patient to help prevent deformity.

Traction devices.—Traction devices are used on neurologic patients largely to reduce or prevent contractures. (1) Skin traction is of limited use in such patients because of the danger of skin changes. (2)

Skeletal traction is very satisfactory, particularly in correcting contractures of the larger joints, such as the knee joint. (3) Active spring or rubber splints are utilized chiefly to give traction to the smaller joints, such as fingers or wrists.

Braces.—Braces are used primarily to permit early ambulation of neurologic patients. In general, they should conform to the contour of the body and be individually fitted. They should be durable and as light as is compatible with adequate strength. Full correction should be attained by the completed appliance. (Figs. 55 and 56.)

(1) *Spine braces.*—The spine braces in common use are generally variations of the Taylor type brace. The general purpose is to give support to the lumbar and lower dorsal spine. Modifications of the upper portion include support for the cervical spine and auxiliary crutch attachments. Lower extremity braces may be attached to the pelvic frame of the brace for stabilization at the hips. Spine braces are used chiefly in paraplegics, but will find some use in severely involved postpoliomyelitis patients.

(2) *Lower extremity braces.*—Lower extremity braces are designed to stabilize and support joints of the lower extremities and to overcome foot deformities. In patients with instability of the hip, long leg braces with a pelvic-band attachment may be required. With weakness of the thigh resulting in instability of the knee joint, long leg braces alone are required. Ankle or foot instability requires only short leg braces with an attachment to prevent foot drop. With simple inversion or eversion, a single-bar lower-leg brace with T-strap attachment is adequate. Whenever possible, braces should be avoided in the interest of developing adequate muscle function. When braces are required, they should be as simple and light as possible.

(3) *Upper extremity braces.*—Upper extremity braces can be made of lighter construction because weight bearing is not a factor. Active functional splints of the spring variety are particularly useful in hand and wrist deformities. These may be adapted for use at the fingers, wrist, or elbow, the most common application being for extension of the fingers and wrist, and flexion of the elbow.



Fig. 55 and Fig. 56—Genu recurvatum and drop foot are corrected by properly fitted braces.

7. SPEECH

There are two common types of speech problems encountered in patients with neurologic disabilities—dysarthria and aphasia. (Fig. 57.)



Fig. 57—A sound recorder gives the aphasic patient the opportunity of rehearsing his own speech.

Dysarthria.—This is a difficulty in articulation, most commonly seen in ataxias, Parkinson's disease, multiple sclerosis, and diseases of the base of the brain. The speech may be slow, slurred, explosive, high-pitched, monotonous, hoarse, or nasal.

It is generally possible to improve the speech of such patients by retraining. The methods of retraining include phonation exercises, controlled breathing, speaking in short phrases, and emphasis upon clarity of speech. Although some improvement may be obtained by personnel in daily contact with the patient, the greatest benefits and improvements are seen when formal speech training is available from qualified therapists.

Aphasia.—Because of their varied manifestations, it is impossible to adequately describe the aphasia disorders. It might be well to list, however, some of the outstanding symptoms encountered: (1) Inability to understand spoken language, (2) inability to understand written language, (3) inability to find the proper words in speaking, (4) inability to formulate words into sentences and phrases, (5) inability to speak, and (6) inability to write.

In addition to the above symptoms, one may see substitutions of incorrect words, repetition of a word which has been used previously, and jargon speech. These symptoms which have been described above have been given various technical names which are not within the scope of this booklet. It is obvious that the treatment of a patient with aphasia will depend upon the specific nature of his speech loss and can only be carried out by a trained therapist. General rules for approaching a person with a speech disorder have been outlined in chapter III on social procedures.

chapter VII. EVALUATION OF RESULTS AND INTERPRETATIONS

Two and a half years ago, the Neurologic Rehabilitation Service was organized under the direction of the Neurology Section at the Veterans Hospital at Minneapolis. During this period (ending December 1948), 289 patients with chronic neurologic disorders, most of them bedridden for years and considered hopeless, were referred to this Service for study and treatment. As of December 1948, 20 had left the hospital or were transferred to other hospitals, 7 had died due to intercurrent disease or to fatal progression of neurologic lesions, and 226, or 74.7 percent of these patients, had been discharged from the hospital as having completed their treatment. Among the discharged patients 89.4 percent attained varying degrees of rehabilitation, while only 10.6 percent were considered as failures, since they were unable to show significant improvement above their admission abilities.

The conclusive demonstration that many of these previously neglected patients could attain some level of self-care and ambulation, or even economic independence, resulted in an expansion of the program and a consequent increase in number of patients discharged from the hospital. The increase in the number of patients discharged from the hospital is illustrated in the following table:

<i>Year</i>	<i>Number of patients discharged</i>
1946 (6 months)-----	19
1947 -----	70
1948 -----	164

Since the seriously disabled neurologic patients constitute the heaviest burden on hospital resources, a special study was made of this group. These patients have widespread, irreversible neurologic lesions, and many, upon admission, were incapable of any form of self-care or of ambulation. One hundred and seventy-five patients from this group were frequently evaluated

from the standpoint of their capacity to perform the ordinary requirements for daily living. The determination of the capacity of each patient to meet exigencies of daily living was based upon the score of his performance (daily activities score) on the self-care and ambulation chart (fig. 25 on page 19).

Upon discharge from the hospital, each of the 175 severely disabled patients received a final rating on their ability to perform the activities listed on the self-care and ambulation chart. Expressed in terms of the percentage of the activities required for daily living, as listed on the chart, the patients were able to perform as follows:

66.0 percent capable of performing 85-100 percent of activities.

13.7 percent (24) capable of performing 60-85 percent of activities.

6.6 percent (12) capable of performing 33-60 percent of activities.

13.7 percent (24) capable of performing less than 33 percent of activities.

Patients capable of less than 33 percent of the activities required for daily living are considered as failures. Of these failures, seven were considered to be due to severe personality disorders and the remainder the result of progressive organic deterioration.

A statistical analysis is being made of the chronic patients at Veterans Administration Hospital, Minneapolis. Although the results of this study are not as yet complete, nevertheless, they have progressed sufficiently to report some pertinent observations. These are:

- (1) A program of total neurologic and rehabilitative treatment will result in the discharge to their homes of about 75 percent of veteran patients on a chronic neurologic ward.

(2) Only about 10 percent of such patients do not benefit at all from the program.

(3) The amount of time required for rehabilitation is greater in older patients and in patients with prolonged disability.

(4) The achievement of maximum benefit from treatment is more dependent upon the duration of the disability than upon the age of the patient, indicating the need for beginning treatment early.

(5) Among the various groups of patients, the hemiplegias show the greatest gains relative to the severity of disability at time of admission. They are followed by the paraplegias, the ataxias, the parkinsonisms, and flaccid paralyses, in the order named. The group of flaccid paralyses, however, improve most within the limits possible for them.

Although the program as described in this booklet has been based primarily on the work carried out at the Veterans Administration Hospital in Minneapolis to meet the great need for treatment of this type of patient, there is an even greater necessity for such a program in the civilian population. It has been estimated that during the first year alone such a program in one hospital saved more than \$1,000,000. From this, it is easy to visualize the total savings to the people of this country if similar treatment were available universally.

Obviously, because of the limited number of trained neurologists and physiatrists, it would be impossible for them to direct the rehabilitation of all such individuals. *A share of this problem will have to be, and rightly should be, handled by the general practitioner, who should assume such responsibility as a part of the practice of good medicine.*

At the Veterans Administration hospital, the program has become quite elaborate. Such rehabilitation procedures can be carried out on the less complicated cases in the home, however, providing the doctor understands his goal, is sympathetic toward it, and is willing to spend a little time with the family and the patient in outlining and directing the course of therapy.

Members of the family can be taught to carry out passive movement in appropriate cases. Pulley exercises can be simply adapted for home use. Self-care and ambulation activities, particularly in the milder

cases, may not need a trained therapist and can be carried on by the family under the supervision of the physician. Even in more severely involved cases, such activities can be continued by the family after a preliminary period under a trained therapist. (Fig. 58.)



Fig. 58—Various appliances installed in the home make it possible for the patient to continue his improvement after discharge.

There are State resources available for the vocational retraining of patients in their homes. (See list of community resources on page 24.)

Since part of the ultimate burden necessarily must fall upon the general practitioner, it seems essential that we begin teaching and indoctrinating our medical students and young physicians in the principles of this rehabilitation program. It is only through their understanding as doctors and their willingness to instruct the family and work with the patient that the maximum number of patients can be successfully handled.

It probably will be necessary, ultimately, to have established centers for neurologic retraining with all the ancillary aids which are now being used to such great advantage at the veterans hospitals. Such a center would serve not only as a part of the educational program for physicians and therapists but would be available for the treatment of the more severe cases

which require intensive care. It would also act as an aid to the practitioner in the diagnosing and evaluating of the more difficult neurologic problems and in outlining the treatment procedures to be carried out at home in these cases.

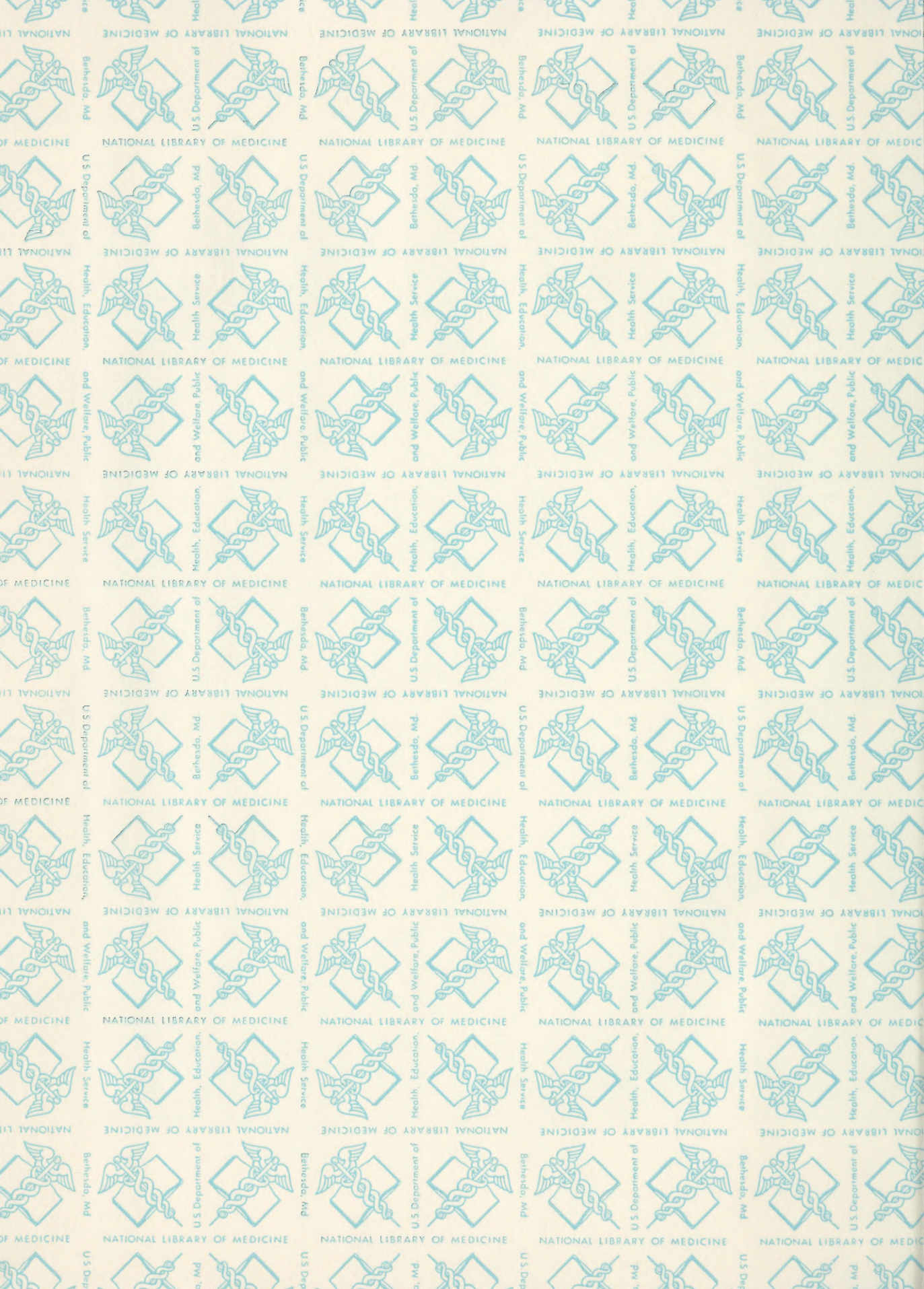
The savings in hospital beds and actual money are

readily measured. Even more important is the immeasurable saving in human suffering. It is hoped that this booklet will stimulate the increasing application of this approach to the problem of the neurologically distabled patients throughout the country. (Fig. 59.)



Fig. 59—The fruits of rehabilitation add years of happy home life to elderly individuals.







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